REPORT

OF THE

SECRETARY OF WAR;

BEING PART OF

THE MESSAGE AND DOCUMENTS

COMMUNICATED TO THE

TWO HOUSES OF CONGRESS

AT THE

BEGINNING OF THE SECOND SESSION OF THE FORTY-NINTH CONGRESS.

IN FOUR VOLUMES.

VOLUME IV.

WASHINGTON:
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1886.

LETTER OF TRANSMITTAL.

SIGNAL OFFICE, WAR DEPARTMENT,
Washington City, October 26, 1886.

SIR: I have the honor to forward, herewith, the Annual Report of the Chief Signal Officer of the Army, for the year ending June 30, 1886. This annual report is largely reduced, being only one-fourth the size of the report for last year; three-sevenths of the report for 1884; one-third of the report for 1883; and less than one-fourth of the reports for the years 1882, 1881, and 1880. The tables in the reports for 1884 and 1885 contained 400 pages, while the tables in this report will not occupy more than 130 pages. Only tables of current value and of a special interest have been selected from the large number prepared.

I am, very respectfully, your obedient servant,

W. B. HAZEN,
Brig. and Bvt. Maj. Gen., Chief Signal Officer, U. S. A.

The SECRETARY OF WAR.

REPORT

OF THE

CHIEF SIGNAL OFFICER.

SIGNAL OFFICE, WAR DEPARTMENT,
Washington City, October 9, 1886.

SIR: I have the honor to submit, herewith, my report upon the work of the Signal Service during the fiscal year ending June 30, 1886, and to refer to the action based upon the report of the Joint Commission of Congress on the Signal Service, appointed with a view to secure greater efficiency and economy in the administration of the public service.

INSTRUCTION.

The course of instruction at Fort Myer, as announced in my last annual report, has been continued during the year, providing for the theoretical and practical instruction of the officers and enlisted men in the duties required of the Signal Corps in time of war and for the meteorological service.

The whole theory of the organization is that the entire force of the Signal Corps shall be available for immediate service in case of war. With this end in view, Fort Myer has been utilized as a post of instruction where the officers and enlisted men are made expert in flag and torch signaling, in the use of the heliograph, telegraphy, and in the service of the field telegraph train. The work of a signal corps now forms an essential feature of all field operations in the time of war, and the history of this corps affords numerous instances where the information furnished the commanding generals during the late war determined the success of the campaign. It is no longer a question that the best signal corps should form a part of every well-organized army. Foreign powers have recognized the importance of this subject, and during peace these corps are employed in making careful experiments, with a view of improving the methods of communicating by visual signals, and in the mode of operating field telegraph trains.

One of the chief advantages of maintaining Fort Myer as a school of instruction has been that men were being constantly instructed in military signaling, and although these men may not remain in the public service they are fully qualified to enter the military service as officers in case of war.

The Division of Military Signaling, which was established last year under the charge of an officer, has been continued, and many improve-

ments have resulted from the special attention given to this subject. A new field telegraph train has been partially constructed, the wagons of which are smaller and lighter than those now used by the Signal Corps, and are therefore better adapted to the rough roads of this country. The heliograph has been improved after careful experiments. A new signal kit has been devised and is now undergoing practical tests; it is believed that the improvement in the torch of this kit will prove specially serviceable. A new signal code has been prepared and adopted for universal use in the Army and Navy. A new manual of signals has also been prepared and will be ready for publication as soon as the reports relative to the tests now being made of the new signal apparatus have been examined.

Thirty carefully selected men were enlisted by the officer in charge of this division, and stationed at Fort Myer. A thorough course of instruction was commenced for the purpose of supplying a number of men expert in all kinds of signaling, and having them ready at a moment's notice for field work. At the opening of the Indian campaign in Arizona I received urgent telegraphic requests from General Miles for men expert in the use of the heliograph, and I was enabled to promptly send three small detachments into the field to aid in this important campaign, and I am informed that these men rendered valuable service, and invite attention to the following extract from the annual report of Gen. Nelson A. Miles, commanding that department:

> Early in April I decided to make prominent use of the Signal Service, and so notified the Chief Signal Officer of that Bureau, and in answer to my request he furnished me ample men and appliances for making that service most useful and effective. The reports of Lieutenants Drave and Fuller show the working of the most interesting and valuable heliograph system that has ever been established. I have made this service useful heretofore, and it would be found valuable in any Indian or foreign war.
>
> These officers and the intelligent men under them have made good use of the modern scientific appliances, and are entitled to much credit for their important service.

Referring to the surrender of the chief, Natchez, General Miles reports:

> They found troops in every valley, and when they saw heliographic communications flashing across every mountain range Geronimo and others (who had already surrendered) sent word to Natchez that he had better come in at once and surrender.

The organizations of signal corps of foreign armies have been studied and several translations bearing upon military signaling made for the purpose of improving our own service. A complete report of the officer who has had charge of the Division of Military Signaling will be found in an appendix.

I am convinced that thorough instruction cannot be given at any post in the Army where signaling is not the chief feature of instruction. Signal apparatus and a field train fully equipped and horsed ready for active service should be maintained for practice and experiment, and I earnestly recommend that the full force of the Signal Corps authorized by law be maintained, and that of this force a company of at least three officers and fifty men be stationed at Fort Myer, or at some other military post, and provided with a section of fully equipped field-telegraph train, for instruction and experiment.

Through the action of the Joint Commission of Congress the school of instruction in meteorological duties and military signaling at Fort Myer is closed, and the Signal Service has ceased to exercise control over that post. I am of the opinion that this was done under a misconception of the facts; and I am confident that it is in conflict with the best interests of the Government. By the terms of the resolution

the Commission was to recommend as to "economy and efficiency," and it is presumed that action was taken upon what was supposed would effect these ends. It was said on the floor of the Senate that Fort Myer was "rather an expensive place," when in fact it was the most inexpensive feature of the Signal Service, and a source of actual saving of many thousand dollars annually to the United States.

The maintenance of that post, under the broad sense of cost, will be presumably the same in either case. The fifty men (which is less than the average that has been kept there the past twelve years, a small per cent. at the depot of instruction at any military establishment) cost no more than common soldiers anywhere, or $15,000 a year, at $300 each. But now these men at once receive commutation for fuel, food, and quarters, indispensable allowances when soldiers are not at a military post, amounting on an average to $812 a year each, or $40,600 before they have learned their duties or can return any service to offset this cost. Besides, by entering in classes semi-annually, as formerly, the average strength of the Corps was 485, saving $12,180, making a total in these two items alone of $37,780. There were other items of several thousand dollars a year saved by the old plan, which cannot be done now.

To offset this, the Commission reduced the Corps thirty men, equaling in money $24,360. Thus, while depriving the service of thirty men, it really added $18,360 to the cost of the service; which fact I endeavored to explain to the Commission.

Fort Myer was a place of probation, where, without expense, men who were unfit for the service, as many who offer themselves are, were weeded out and discharged. Now this cannot be done until much money has been spent upon them, and the service impaired by bad work and conduct. Nor is it understood how men entering upon this vocation without preparation are as efficient as when that preparation is complete, as was the case here. The present plan must inevitably bring into the service many men not fit for it, and this fact cannot be learned until much time and money are lost and the service impaired. I had supposed these considerations would control the action of the Commission, but it could not have fully understood the subject.

I found Fort Myer in a wretched condition of dilapidation and decay, and with the five years of attentive work which I had given it (without calling upon the Government for money, mainly by a systematic use of freedmen's labor for rents) it was fast becoming a beautiful and valuable suburb of the capital. I therefore exceedingly regret that this work must now largely go to waste on account of the great difficulty in keeping it in order, because of its uneven site, easily washed by rains, and the want of facilities in a line command, unless, as I hope, Congress, which I believe acted from a misconception of the facts, will recede from its action before the harm to the post and the Signal Service is beyond remedy.

The action of this Commission tends to stop instruction in military signaling also; and it was said upon the floor of the Senate that this action was based upon the testimony of the Lieutenant-General, that the Army was doing this sufficiently well without the Signal Corps, and it was said in debate that the unanimous testimony supported this view. This was either erroneously stated, or the testimony was not exhaustive.

I believe this action was taken also upon a misconception, and it is opposed to the military spirit of the times. My opinion is based upon the fact that the practice of signaling in the Army had run into

neglect, until required to be resumed by a recent order asked for by the Chief Signal Officer, and upon the fact that General Miles and other commanders in the field earnestly called for and received detachments of Signal Service men for signal duty because the line of the Army could not furnish them, and also because good military service requires specialized duties, and that all other good armies specialize this work. The use of the telegraph, the heliograph, and other complicated instruments, and the running of telegraph lines, require too great experience to be acquired by any but those specially trained for it. The value of a staff officer well versed in the use of these instruments, who can at any time cut in upon the line of telegraph, may be of incalculable value.

This reference was necessary, since the law, both presumably and by mandate, makes the Chief Signal Officer responsible for the efficiency of this branch of the military service, and it would seem that this action is not in harmony with that fact, but has largely deprived him of the facilities for doing what the law requires.

The instruction of officers charged with the preparation of weather predictions, the announcement of approaching frosts, and the ordering of storm signals now embraces a course of study under the most distinguished professors of meteorology in this country.

The course of instruction in military surveying and field sketching was included with the above with a view of increasing the efficiency of the signal officers in field work in time of war. Seven second lieutenants of the Signal Corps have pursued the course during the year. There are officers of the line now serving as Acting Signal Officers, who have been connected with the service for years, who have done a greater portion of the work which makes the service a necessity, and who ought to be retained in the service.

The Joint Commission of Congress said of them in its report:

> The Commission also believe that the Army officers * * * have also been of very great service in the past, and that their knowledge and experience should be utilized in the future, as to them is largely due the credit of building up the service to its present degree of usefulness.

Congress, recognizing the importance of retaining these officers of long experience permanently with the corps, enacted as follows:

> And the Secretary of War is authorized in his discretion to detail for the service in the Signal Corps not to exceed five commissioned officers of the Army.

It is important to the service that these officers should feel the degree of permanency indicated by the Commission.

The study of popular meteorology has been greatly stimulated by the work of the Signal Service and the popular interest in this subject which is increasing, owing to the wider distribution of the daily weather forecasts of this service, has induced many colleges and schools to add a course in meteorology as a part of the regular course of instruction. To meet the demands for a text-book, I directed Prof. William Ferrel, Assistant, to prepare a work which would serve as a text-book for advanced students of meteorology. This treatise has been printed and will soon be ready for issue. It contains the most appropriate and important of the various papers of original research on meteorology.

The object of this work has been to select from the material on hand some of the more important principles, methods, and results arrived at mostly during the last quarter of a century, and to present them in the form of a text-book for use in the meteorological work of the Signal Service.

A knowledge not only of correct principles and the best methods, but also of what has already been done, is of great importance to any one who would engage in any line of meteorological work, and especially of original research. Many very important laws have recently been deduced theoretically and confirmed by observations and experiment. Solar and terrestrial radiation, the conditions determining temperature, the relations between the amount of solar heat received by different parts of the earth's surface and the corresponding resulting temperature, the effect of the deflecting forces of the earth's rotation on the mechanics of the atmosphere, and the theory of the general motion of the atmosphere, and of cyclones, tornadoes, &c., are subjects which have recently received much attention.

The Signal Service has been specially fortunate in securing the service of one so thoroughly qualified to prepare this valuable work, and its publication will materially aid the work of this service. An extended series of observations has been taken at various altitudes with a view of revising and correcting the hygrometric tables. These observations have been examined and new tables computed for the use of this service. Professor Ferrel's report on this subject is given in an appendix.

A new system of tables for the reduction of the barometer to sea-level has also been prepared by Professor Ferrel, whose able discussion of this important subject forms a part of this report.

The work of preparing a treatise upon the whole subject of meteorology and on the theory of instruments used in meteorology, by Prof. Cleveland Abbe, Assistant, is in fair progress, and it is hoped that it will be ready for publication within the year. When this work is completed it will serve as a popular text-book for students of meteorology.

Several translations, giving the most recent and reliable results bearing upon the science of meteorology, have been completed, and some means should be provided which would enable this service to republish the more important of these.

The plan of securing as observers young men qualified by education for the pursuit of scientific studies, and thus raising the standard of the enlisted force of the Signal Corps, has now been in operation five years, and of the three hundred and seventy-eight enlistments made during that time, ninety-seven were college graduates; and it has proved of benefit to the service.

INDICATIONS.

The weather forecasts and cold-wave and storm warnings have been regularly issued during the year, and the increasing demand for these forecasts may be taken as evidence of their value. The office is unable to comply with the numerous requests received from cities, towns, and corporations for the special warnings, owing to the limited appropriation for this branch of the service. The manner of making these predictions has been improved by substituting the names of States in place of the names of arbitrary districts previously used by this service. This plan removes all doubt as to the territory to which the prediction applies.

The forecasts prepared at 1 a. m. are telegraphed by special message to the principal centers of population, to the directors of State weather services, and to various lines of railroads, for the information of the public. Signals have been devised for the purpose of extending the information thus conveyed, and a large percentage of the population

are enabled to obtain the indications through these visual signals. When practicable, at midnight the Indications Officer is required to make special weather forecasts for selected States applicable to the succeeding forty-eight hours.

In addition to the regular indications, which are issued tri-daily, a special bulletin is issued whenever the conditions indicate changes in any section of the country which should receive especial mention. This bulletin contains warnings of approaching frosts, cold waves, dangerous floods, and the movement of well-defined storms, and the officer who prepares this bulletin is directed to telegraph to all Signal Service stations in the threatened regions, and the observers receiving such dispatches are directed to give still wider distribution by using every means by which they may reach the general public. Special bulletins are also issued on the first of each month, containing a general statement as to the mean temperature and total precipitation of the month just closed, together with brief descriptions of damaging frosts, severe storms, &c., which may have occurred. The information thus promptly furnished is utilized by those interested in agriculture and the grain trade, and it contains official information as to the weather conditions which have existed during the month in all sections of the country.

Indications have been issued from San Francisco during the year for the States on the Pacific coast with a view of giving the people living on that coast the full benefits of the service. This is of great value to many special interests. Cautionary signals have been established, special monthly bulletins issued, and meteorological data of interest to the people of the Pacific coast have been collected and disseminated.

The instructions governing the work in the Indications Division have been revised, and new and more rigid rules for determining the percentage of accuracy of the indications have been adopted, and the use of ambiguous language in the indications prohibited. A copy of these instructions and rules will be found in an appendix.

The weather indications and storm warnings of this service would become more valuable if regular stations were established in the West Indies, and the number of stations increased in the West and in British America. Reports received from the sea-coast telegraph lines, in some cases, are of special value in the issue of storm warnings and securing aid for stranded vessels. Valuable cargoes have been saved and sailors rescued by the prompt information communicated over this line by Signal Service observers, and it should not only be maintained but extended along the more dangerous portions of the coast.

The following tables show the percentage of accuracy of the indications during the year. Each forecast of the several meteorological elements is carefully compared by the Indications Board with the weather conditions actually reported during the time for which the weather forecasts were made:

Percentage of verifications of indications for each month of the year ending June 30, 1886.

Year and month.	Weather.	Wind.	Temperature.	Barometer.	General average.
1885.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
July	78.56	74.59	78.86	82.78	77.44
August	79.84	70.30	80.00	87.08	76.90
September	86.61	75.52	77.22	81.51	79.95
October	84.53	77.11	76.66	81.59	79.69
November	83.19	75.77	76.93	84.83	79.08
December	85.24	77.99	76.79	87.94	80.98
1886.					
January	83.06	70.45	76.55	77.34	79.41
February	86.85	80.10	82.27	82.78	83.04
March	79.04	74.22	74.91	84.67	76.25
April	83.71	80.21	75.82	76.89	79.87
May	79.05	75.99	72.80	75.53	76.10
June	77.71	67.66	73.86	....	73.07
Sums	987.39	908.91	922.67	902.89	941.78
Averages	82.28	75.74	76.89	82.04	78.48

The above table has been computed for the several elements and not for the geographical districts, as the forecasts were prepared for the individual States during the latter portion of the year.

The display of storm signals for the benefit of marine interests has been continued during the year, with excellent results. With a view of improving this feature of the Signal Service I directed a careful examination to be made of the system of storm signals of this service, and this investigation resulted in a new system of cautionary signals which went into operation May 1, 1886. A complete report giving the details of this new system of signals is inclosed.

The following table shows the number of storm signals ordered during the year ending June 30, 1886:

Cautionary signals displayed during the year ending June 30, 1886.

Year and month.	Signals of all kinds.		
	Number ordered.	Number justified.	Per cent. justified.
1885.			
July	75	38	50.7
August	120	76	63.3
September	177	129	72.9
October	152	131	86.2
November	276	198	71.7
December	232	207	98.2
1886.			
January	190	155	81.6
February	199	179	90.0
March	162	137	84.6
April	152	84	55.3
May	52	24	46.2
June	59	11	20.3
Total	1,846	1,369	74.2

COLD-WAVE SIGNALS.

A full description of this signal and the principal features of the system of cold-wave warnings of this service were published in my last annual report.

The progress made in this important branch of meteorological work has been highly satisfactory, not only as regards the accuracy of predictions but also in the greatly increased facilities for disseminating the warnings of the approach of cold waves.

The interest manifested by the general public, and the expense incurred by a large number of citizens in the purchase and proper display of cold-wave signal flags, sufficiently attest the value and importance of the system, and, judging from the reports made by observers during the year, I am convinced that property to the value of many millions of dollars has been saved through the agency of this service.

When it is expected that the temperature will fall suddenly fifteen to thirty degrees, or more, in any section of the country, the cold-wave warning is immediately telegraphed to selected stations of the Signal Service from twenty-four to forty-eight hours in advance, at which the cold-wave flags are immediately hoisted, in order that the public may be fully informed. The information is then sent by telephone and telegraph, whenever practicable, to all towns and railroad stations in the vicinity of the Signal Service stations displaying the signals.

Cold-wave signals are not ordered unless a temperature of forty-five degrees or less is expected. When the temperature is expected to fall twenty degrees, or more, in any district, and not reach forty-five degrees, announcement of *cool wave approaching* is made in the "Indications," but no signals are displayed.

Cold-wave warnings issued during January of this year were especially valuable in all sections of the country. Many individual reports have been received containing estimated value of the property saved through these warnings. I have received many applications for extension of this system for the protection of perishable goods and the sugar and fruit regions of the South. The cold-wave signal is now displayed, by orders from the central office, at two hundred and ninety cities and towns in the United States and from these points distributed by telephone and railways to about twenty thousand stations.

The special report upon this subject, which will be found in Appendix No. 5, contains the detailed statement of the display of these signals at each station, with the resulting benefits. There is no feature of the service which has proven more valuable, and the system should be extended to every town in the United States, and also to stock agricultural districts where practicable. Many citizens have signified their willingness to purchase flags and display them at their own expense, provided the Signal Service would telegraph the warnings. I recommend that the sum of $5,000, to be expended for the extension of this system, be added to the estimates for the fiscal year ending June 30, 1887, and in my judgment there is no appropriation which would be more acceptable to the people.

The following table shows the number of cold-wave signals displayed, with the number and percentage justified:

Percentage of verification of cold-wave signals for months in the year, when they were necessary, ending June 30, 1886.

Year and month.	Number displayed.	Number justified.	Per cent. justified.
1885.			
October	93	72	77.4
November	150	126	84.0
December	149	139	93.3
1886.			
January	326	268	82.2
February	268	247	92.1
March	79	59	77.2
Total	1,065	911	85.5

Of the 1,065 cold-wave signals displayed during the year, 911, or 85.5 per cent., were justified.

The work in this important division requires special study and experience to insure the best results, and the assistants who make the weather forecasts of this service should devote their whole time to the study of meteorology, and especially to the study of the tri-daily charts. This I expect soon to require.

STATIONS.

The number of stations in operation June 30, 1886, in the United States, was 452. These include the telegraph stations, display, special river, cotton region, sunset, and 12 repair stations. In addition, reports are received from 24 Canadian stations, by the co-operation of the Canadian Meterological Service. Telegraphic reports are received at this office, daily, from 160 stations.

During the year four full reporting stations have been established and eleven discontinued. In addition to reports received from regular stations, 288 voluntary observers and Army surgeons at 65 military posts have furnished monthly reports which have been used in preparing the current publications of this office. The office has continued to co-operate with foreign observers in collecting simultaneous meteorological reports, and in this work reports have been received from 294 foreign stations and 616 naval and merchant marine vessels.

The reports received from stations have been carefully compared and tabulated for publication. The tables accompanying this report have been so arranged as to present a complete history of the meteorological conditions of the year. The weather, temperature, and rainfall for each month of the current year will be found useful in the study of climatology. In compliance with your instructions, I have had the tables of meteorological data usually published as part of the annual report of this Bureau carefully examined, and from this report I have excluded all data which is not specially useful to the public. Numerous tables previously published have been omitted and others condensed, so that this feature of the report will not require more than one-half the usual space given to meteorological data.

WEATHER SIGNALS.

The system of flags to indicate the probable conditions of weather and temperature recently adopted by this service has been universally commended by the public, and the region over which they are dis

played has greatly increased during the year, and the office, for want of funds, has not been able to supply the demands. These flags are extensively displayed on lines of railroads and at railroad stations, and communicate by signal the weather forecasts of this service to many who are not within reach of the daily mail and to those who are not supplied with the printed indications.

Being desirous of ascertaining the opinion of the general public as to the value of this service, I addressed a circular letter to those in charge of the display of these signals at various points, requesting that they report to what extent they give satisfaction. More than two hundred and fifty replies were received, commending in the highest terms this new feature of the Signal Service, which gives to many cities and towns the advantages of a signal-service station without expense to the Government. These are volunteer stations, and the flags are purchased by individuals, and a single telegram, costing not more than twenty-five cents, may serve to give the weather indications to many stations. For example, the State Weather Service of Alabama distributes the weather indications of this service to upwards of four hundred stations in that and adjoining States at an expense of not more than two dollars per day. This economical distribution of the warnings is due to the generous co-operation of the several lines of railroads within that region. These stations are also supplied with cold-wave flags and receive the warnings from this office in like manner.

In addition to the system of flag-signals, a system of symbols is used by a number of railroad companies, these symbols being displayed on moving trains. The introduction of the signals and the rapid progress made during the year in establishing points of display indicate the rapid extension of the benefits of the Weather Bureau, and I am confident that its value to the country may be largely increased by further extension of the facilities for distributing the weather forecasts made by this office. The commercial and agricultural interests may receive greater benefits by increasing these stations. The service should be prepared to furnish flags and transmit daily telegrams to all important towns requesting the weather forecasts; and I recommend that $10,000 be added to the estimates for the fiscal year ending June 30, 1888, for this purpose.

FLOOD WARNINGS.

The work of watching, recording, and giving timely warning, by telegraph, of the rise and fall of rivers is an important feature of this service. During the past year I have reorganized and extended this system of reports; new river gauges have been supplied and the danger lines more definitely determined. The daily reports of the condition of rivers, telegraphed to this office, are carefully examined by the indications officer, and these reports (considered in connection with the amount of rainfall occurring in any section) enable him to closely estimate the change likely to occur in the stage of water at neighboring river stations. The rate of movement of freshet waves in rivers upon which stations are located has been determined, and timely warnings of their approach are given to the threatened districts by the issue of special bulletins. A careful estimate shows that property valued at $128,000 was saved at a single station (Nashville, Tennessee) by the flood warnings of the Signal Service on the Cumberland River during March and April of the current year. The expense to the Government in communicating the above warnings to all stations of that system,

including pay of river observers, was $27.80. This single example illustrates what is being done in the whole system.

These reports are not only valuable in times of flood, but they also serve a most valuable purpose in times of low water, enabling shippers to direct the movements of their vessels at the different points along the river course. These reports are serviceable to the agricultural and manufacturing interests in the river valleys. It is an economical service and should be extended. A detailed report, giving the organization of the river system and the value of the reports at the various stations, is inclosed.

RAILWAY-BULLETIN SERVICE.

This system continues in active operation, and its increasing popularity is made manifest through reports from railroad stations at which the indications are posted for the benefit of the public.

This mode of disseminating the weather predictions is most highly appreciated by the agricultural interests in sections traversed by co-operating railroads; farmers consulting the bulletin at their local railway station, to be guided by its warnings before beginning the work of the day.

The indications are telegraphed over their lines by co-operating railroad companies each morning, without expense to the United States, and posted at 1,349 stations throughout the country. A few telegraph and telephone lines have within the past year taken up this system of distribution of the indications, and reports from their officials show that the success of the undertaking is much beyond their expectations.

A list of railroads and telegraph and telephone lines co-operating in this work will be found in an appendix.

REPORTS FOR THE BENEFIT OF THE COTTON INTERESTS.

This system, which has now been in operation five years, has been continued under many disadvantages, owing to the small appropriation made for this work. It was inaugurated at the earnest solicitation of many prominent citizens of the South, especially the cotton-growers and those interested in the sale of this important staple, as an experiment. This service has never been able to establish the necessary number of stations over the wide area of country where this crop is grown to insure the best results, nor has there been sufficient money appropriated by Congress to pay for telegraphing the observations, and therefore the service still relies upon the generosity of various railroad and telegraph companies for the free transmission of the messages. This free service was only promised long enough to test it, a period long since expired.

The pay of the special observers employed is so small as to offer no inducement for prompt and reliable work. This service is of so much importance to those specially interested that a demand should be made for a sufficient appropriation for an increased pay of observers and for prompt telegraph work.

The cotton crop is more or less at a risk during at least nine months of the year, and there is great need of prompt, accurate, and impartial information concerning the atmospheric influences and changes therein. Provision has been made for the maintenance of the 150 stations during the present season and the indispensable payment of the telegraph tolls by the Government. The stations have also been inspected by observers of this service experienced in taking observations. Each inspector

was directed to examine the location of instruments and to see that they were properly exposed. It has been my effort to make these reports valuable to those interested in the cotton crop, and if they are continued during successive years, and their results compared with the cotton production of corresponding years, the conditions particularly favorable or unfavorable may be determined some months in advance of the time at which planters are at present enabled to estimate the value of the crop.

TELEGRAPH DIVISION.

The regular tri-daily weather reports in cipher were received during the year over the wires of the Western Union, International Ocean, Florida, Gulf Coast, and Northwestern Telegraph Companies, and the promptness with which this large amount of telegraph work was performed enables me to report that the Signal Service has not once failed to issue its regular tri-daily forecasts. One million seven hundred and seventy-five cipher words were received and sent, and 80,590 telegrams for indications, cautionary signals, cold waves, frost warnings, &c., were sent and received from this office during the year.

UNITED STATES TELEGRAPH LINES.

At the opening of the year there were 2,582 miles of military telegraph lines under the control of the Chief Signal Officer, with 77 offices at or in connection with military posts on the frontier, and these lines were operated, with few exceptions, by the enlisted men of the Signal Corps. These lines were distributed among the several military departments, as follows:

	Beginning of year.	Ending of year.
	Miles.	*Miles.*
Department of Dakota	893	740
Department of the Missouri	582	582
Department of the Columbia and California	512	444
Department of Arizona	510	510
Department of the Platte	85	85
Total	2,582	2,361

Three hundred and three miles of telegraph line were abandoned during the year. Many of these lines are located on the frontier where Indian campaigns are likely to occur, and as they form the only communication with military posts they should be continued in repair.

The total receipts from tolls for commercial messages transmitted over the military telegraph lines during the year amounted to $13,184.84; in addition $22,324.31 were collected at military offices as tolls due commercial lines.

These telegraph lines are important factors in the protection of the widely extended frontier, especially in forming lines of communication for military posts over which information may be immediately sent in cases of Indian outbreaks. Wherever these telegraph lines extend meteorological stations have been established, and by this means sections of the country which were not traversed by commercial lines have been occupied by stations of observation.

The stations on these lines have formed a line of outposts for the weather service of the country, and the observations thus telegraphed have been of great value to the service. It is the policy of this office to abandon military lines as soon as the territory becomes accessible by commercial lines, the material of the abandoned line being either sold at auction or utilized in the construction of new lines at other points.

SEA-COAST TELEGRAPH LINES.

These lines extend along the Atlantic coast, in sections, from near Boston to Cape Fear River. Their purpose is to enable this service to secure meteorological reports from exposed points on the coast at which cautionary-signal stations might communicate warnings of dangerous storms to passing vessels. In the past it has served to communicate messages which secured prompt assistance to vessels in distress, and many lives and valuable cargoes were saved which, but for this line, would have been lost. It constitutes a coast guard, and should not only be continued but extended along the entire Atlantic coast. Such a completed line kept in good repair would not only add to the efficiency of this service but would also form a valuable adjunct to the Life-saving Service in the performance of its important work. The only additional sea-coast line constructed during the year was that connecting the island of Nantucket with the mainland, via Martha's Vineyard and sub-marine cable, 23 miles in length, and 38 miles of land line extending to various points on the island.

The importance of this system of lines and cables is evident from the amount of shipping on the water highway of Vineyard Sound, which bears annually from 35,000 to 42,000 sail and steam vessels engaged in the coast trade. The Signal Service stations at Wood's Holl, Cottage City, Edgartown, and Nantucket, with the display stations at Cedar Tree Neck, Sankaty Head light-house, and Gay Head light-house, when the latter is established, will furnish full and complete warnings of storms, high winds, and the general features of the weather to this great moneyed interest. The Signal Service is held in high esteem by these people, and they desire an extension of the benefits arising from the same. They regard with great satisfaction the connection of the light-house and life-saving station at Surf Tide, Nantucket, by telephone, with the telegraph offices. There is no question that this system is one of the most valuable operated by the Government, reaching, as it does, a highly cultivated, intelligent, and energetic class of people, and every effort will be made to place intelligent men at these stations and make it still more perfect and in every way worthy of the support that the people are willing to give it.

FROST WARNINGS.

The system of special frost warnings for the benefit of the tobacco, cranberry, sugar, raisin, and fruit-growing districts was continued in operation as organized in 1882.

The entire frost-warning system now embraces twenty-seven centers of distribution to which the warnings are sent from this office, and eight hundred and twenty-two frost stations where the warnings are bulletined and otherwise disseminated as soon as received from the centers. With the ready and efficient co-operation of the railroad and telegraph companies, a system of telegraphic circuits has been established for each center by means of which the warnings can be dis-

tributed with the least possible delay. The great drawback lies in the fact that rapid distribution is necessarily limited to points at or near telegraph stations, but it is expected that with the growing organization of State weather services a more general distribution of these warnings, by signals or courier, will be gradually provided.

The tobacco-growing districts to which warnings are sent are located in the western half of Massachusetts and the State of Connecticut, a portion of Southern New York, the eastern half of Pennsylvania, Central Maryland and Virginia, the western halves of North Carolina and Tennessee, the State of Kentucky, Southern Ohio and Indiana, Eastern Missouri, and the southern part of central Wisconsin.

Cranberry interests are protected in Central Wisconsin, in Barnstable County, Massachusetts, and along the Camden and Atlantic Railroad in New Jersey.

Frost warnings for the benefit of sugar-growers are distributed in Louisiana, from New Orleans as a center, and the fruit-growers of Florida receive warnings from Jacksonville and Sanford. Special messages are also sent from this office to points in North Carolina, South Carolina, Tennessee, and Texas.

Many commendatory reports have been received from planters and others interested, showing that this frost-warning service, even limited as it is, is of the highest value to the interests they are intended to protect. The expenses are trifling compared with the value of the information, being limited to the cost of telegrams at one-half the usual Government rates and to that of the blanks on which to bulletin the warnings.

STATE WEATHER SERVICES.

The plan of organizing State weather services, co-operating with the Signal Service, has met with encouragement during the year, and the evident value of such organizations in affording means for the rapid and economical distribution of the weather forecasts and frost and cold-wave warnings of this service has led me to arrange for establishment of similar service in States where they are not now in operation. The object of these local organizations is to increase, without expense to the General Government, the number of stations at which meteorological observations may be taken. The data thus collected by voluntary observers are utilized: First, by the chief of the State services issuing a bulletin, either weekly or monthly, containing an accurate and impartial description of the weather conditions which may have prevailed in the State during the time covered by the bulletin. Second, by the Signal Service at the central office in the preparation of the Monthly Weather Review, containing an account of the general weather conditions throughout the country during the month.

These local services also supply observations for special study of meteorology and climatology, and some of these services have issued interesting and instructive discussions on selected subjects containing general information which may be utilized in the work of this service. As an example of the economical distribution of the weather indications through these organizations, the distribution by the State weather service of Alabama, previously referred to under the head of indications, is cited. This single dispatch to the chief of the Alabama service is repeated by him to more than four hundred stations in that and the adjoining States at an expense not greater than $2 per day. Independent of the interest these services have developed in the subject of meteorology, they are educating the people as to the value

of the weather reports, and enable a large class of the population not within reach of the daily papers to use the weather indications in the various industries. The great problem of this service is to discover the means which will enable it to communicate to threatened localities the information which is received at the central office of approaching weather changes, and no plan is more effective or economical in attaining this desired end than through the well-organized State services. With a view of improving this important feature of the service, I invited the several chiefs of State services to meet in this city to discuss various questions pertaining to the work being performed, in order that uniformity of action might be secured. A complete report, giving the operations of this branch of the service, by Lieut. H. H. C. Dunwoody, Acting Signal Officer and Assistant, who first suggested the organization of these services in connection with the Signal Service, will be found in an appendix.

SIGNAL-SERVICE AGENCIES.

Signal-service agencies for the benefit of commerce and the marine interests have been maintained during the year at New York City, Boston, and Philadelphia. The agencies supply the captains of vessels with publications of this service in which they may be interested, such as descriptions of storms in the north Atlantic, the location of ice which may prove dangerous to navigation, and also provide standard instruments for comparing those used on board vessels. Four thousand and seventy-two ships' barometers were compared during the year with Signal Service standards, errors determined, and correction cards furnished. These vessels furnish in return simultaneous observations, which are used in the study of ocean meteorology. Weather reports have been received from five hundred and eighty-one vessels, of which seventy-three were furnished by the New York Herald weather bureau. Abstracts of logs of five hundred and fifty-seven vessels have been prepared and forwarded to the central office. In addition to these, the service is indebted to the New York Herald for one hundred and seventy-one and the New York Maritime Register for five hundred and twenty-one abstracts of logs. Arrangements have been made with the Meteorological Office of London, without expense to this service, for telegraphing to it the storm conditions reported by vessels arriving at ports of the United States. One hundred and twenty-five of such cablegrams were transmitted during the year. These dispatches contained specific data, obtained from incoming steamers, showing the location of icebergs, derelict ships observed, and position and bearing of storms encountered west of the fifty-fifth meridian.

The relations between the shipping interests and the Signal Service are satisfactory, and the Weather Bureau is generally commended by those interested in the commerce of the country.

SPECIAL WORK UNDER PROF. CLEVELAND ABBE.

Scientific correspondence.—This comprises questions bearing upon the work of this service and relating to hygrometry, hypsometry, evaporation, solar radiation, thunder-storms, tornadoes, sun-spots, and various other subjects pertaining to meteorology.

The sextant observations made by Lieutenant Lockwood during the sledging journey on the north coast of Greenland, in which he reached the "farthest north," were examined and found to be highly satisfactory.

The report thereon will appear as an appendix to Captain Greely's official report of the expedition to Lady Franklin Bay.

Tables of monthly constants for the reduction of the barometer have been corrected for current changes. Much time has been given in this division to the discussion of the details of the new system of reducing the barometer to sea-level, and finally the whole subject was placed in the hands of Prof. William Ferrel, whose report on this subject is given in an appendix. Latitude, longitude, altitude, and magnetic variation stations have been furnished as required.

The question as to the proper exposure of thermometers in order to obtain the temperature of the air in the immediate neighborhood has been considered, and improvements adopted which promise more reliable results. Comparative observations have been made during the year with a view of improving instruments for determining errors in the movement of the velocity of the wind and for the purpose of determining the best location of rain-gauges. Meteorological observations have been taken at high altitudes during several balloon voyages, for the purpose of supplying data for the special study of the several meteorological elements. These observations are now being discussed.

The course of instruction for the second lieutenants of the Signal Corps included a series of lectures by Prof. Cleveland Abbe, Prof. T. C. Mendenhall, and Prof. William Ferrel, covering the general subjects of meteorology and natural philosophy. The class of officers were required to attend these lectures daily, and written examinations were held monthly from which the proficiency of the several members of the class in the subjects considered was determined and reported upon. A number of professional papers, Signal Service notes, and translations, which would prove valuable if published, have been prepared.

It would seem that restriction prohibiting the publication of such papers by a scientific bureau should be removed, as the results obtained by the careful study of these subjects should be given to the public, and these results would serve to improve the current daily work of this service. The work of collecting material for the subject index and author catalogue to the literature of meteorology has been continued, and this valuable work will probably be completed and ready for publication during the current year. The work of the present year has been chiefly the collection of new titles, the correction and completion of those already on hand, the formation of a subject classification, the actual classification of the titles by subjects, and the preparation of an author index.

A complete report of the work by Prof. Cleveland Abbe, Assistant, under my direction, will be found in an appendix.

INSTRUMENT DIVISION.

This division has the custody and care of all instruments, their comparison and adjustment with standards, and all questions relating to the use and construction of instruments are referred to this division for necessary action. About 5,000 instruments have been tested and issued in this division during the year. Improvements have been made in the instrument room both as to the method of keeping accounts and as to the character of the records. All thermometers and rain-gauges have been carefully tested, new forms have been introduced, and experimental studies of instruments have been made for the purpose of establishing a normal barometer, improvement in thermometers, psychrometers, and other instruments used in this service. The new rain-gauge

has been introduced to a considerable extent, over one hundred and fifty having been constructed during the year, many of which are now in use. Preparations have been made for the introduction of smaller wind-vanes than have generally been in use. The large 16-foot wind-vane is unquestionably too sluggish in its action, and it is proposed to substitute one of a much smaller pattern. Much progress has been made in the study of atmospheric electricity during the year. For the purpose of investigating electrometers, collectors, and exposures, extended series of experiments have been conducted at this office. Six new electrometers, constructed after specifications prepared at this office, have been ordered for the prosecution of these studies. Several new stations have been established throughout the country at educational institutions where special electrical observations are made. These observations are collected and the results published in the "Monthly Weather Review." Much interesting work has been done by means of simultaneous observations at this office and at the Smithsonian Institution. In connection with the subject of atmospheric electricity it may be mentioned that a series of experiments are under way for the purpose of determining the proper form and dimensions of lightning-rod "grounds." This is a matter of great importance and the results of the investigation will be of great practical value.

Experimental study in the methods of measuring ground temperature by means of electricity has been continued during the year, with very satisfactory results. I am indebted to Prof. E. S. Morse, of Salem, Mass., and Mayor John Gould, of Portland, Me., for a series of interesting and valuable observations of underground water-temperature. A detailed report of the work of this division, by Prof. T. C. Mendenhall, Assistant, will be found in an appendix.

BOARDS OF TRADE.

The service continues its co-operation with boards of trade, chambers of commerce, and other commercial organizations in the large cities of the country, and relies upon these associations for advice as to the distribution of reports and the supply of weather indications which may be of interest in various sections of the country. Many of these organizations have appointed committees to confer with the Chief Signal Officer upon matters relating to the Signal Service as far as the work of the bureau will bear upon the commercial interests which they represent, and I am pleased to acknowledge the valuable assistance which these associations have rendered in aiding me to make the Signal Service more valuable to the country.

The board of trade at Saint Paul has taken charge of the State Weather Service of Minnesota, and under its excellent management there will be secured for the wheat-growing region of the Northwest what the system of cotton-belt observations has secured for the South, viz., prompt, accurate, and impartial information concerning the atmospheric changes, and daily reports of rainfall and temperature during the growth of the crop.

Maritime associations of the country acknowledge the value of the storm warnings, and have asked for their extension. Reports show that valuable cargoes have been saved by vessels remaining in port in obedience to the warnings issued by this service. The shipping interests of the coast call for additional and more extended information during the cyclone season. It is important that this service should receive the first notice of the development of these storms in the West

Indies, in time to give telegraphic notice of their existence, in the various ports of the United States, several days before the storm reaches the coast. The bill now before Congress providing for the establishment of six stations in the West Indies expresses the demands of the shipping interests of the country and it should pass, as these stations will materially aid this service in giving notice of the approach of these destructive storms.

ARCTIC WORK.

The report of the scientific observations of the Lady Franklin Bay Expedition is in course of preparation.

The actual observations, covering nearly three years' hourly record of pressure, temperature, clouds, rainfall, auroras, humidity, tides, and sea temperature, have been copied, and the sums and means calculated at Fort Conger have been checked and verified, and are substantially ready for publication.

The appendices, which were to be prepared by the U. S. Coast Survey, are in progress. The magnetic observations have been completed, reduced, and discussed by that office. The tidal observations and pendulum work are in the course of preparation, and the complete report will be ready for the printer in a few weeks.

Apart from the receptions tendered by cities, corporations, and clubs in America and Europe, Lieutenant (now Captain) Greely has received the following distinctive honors and awards:

The thanks of the Commonwealth of Massachusetts.

Complimentary resolution of the Legislature of Dakota.

The thanks of the British Government for the return of union jack and admiralty dispatches.

The founder's medal of the Royal Geographical Society.

Complimentary resolutions from the Geographical Society of Paris.

Complimentary resolutions from the American Geographical Society.

Complimentary resolutions from the Geographical Society of the Pacific.

Election as honorary member of the British Association for the Advancement of Science; Scottish Geographical Society; Royal Swedish Anthropological and Geographical Society, as well as of other less well known associations.

Sergeant David L. Brainard has received from the Royal Geographical Society the *Back Grant* for 1886.

Some substantial reward should be given to the members of the International Polar Expedition, and it is hoped that Congress at its next session will recognize the successful work performed by Lieutenant Greely and his party by providing promotions of the survivors and support for the families of those who lost their lives while serving with this expedition.

APPROPRIATIONS.

The appropriations for this service have been expended under my close scrutiny and in accordance with the law authorizing it. This service has been maintained and good results secured, but it has been impossible to carry on the full work of the Bureau; while a slight increase in the appropriations would have enabled me to largely increase the benefits of the service to the people.

Additional cautionary-signal stations should be established on the lakes to meet the demands of those interested in lake navigation, and, to make this feature of the service complete, funds should be supplied, which would enable me to keep these stations open at night during the storm seasons; this cannot be done now.

The cotton-region reports are becoming more valuable each year, and there is an increasing demand for the information thus furnished, but the limited appropriation for this branch of the service prevented me from commencing this system of reports at the usual date, April 1. These observations should be made continuous the full year, and the best results can only be secured by an increase of the pay of these observers. The estimates submitted for the coming year have been prepared with great care, and cover only the absolute needs of this service, which experience has demonstrated should be provided for, if the work of the Bureau is maintained on its present basis; but the service is growing, the demands upon it are increasing, and much more good work could be done in the distribution of weather forecasts, storm, frost, and flood warnings, if the appropriations for these branches of the service were increased.

The improved modes of administering the duties of the property and money division, inaugurated by me, have continued, together with some changes made during the year, in order to make the accounts more explicit and technically correct.

It is thought that the accounts now made up and rendered will be satisfactory to the accounting officers of the Treasury Department.

The advantages afforded to obtain greater accuracy by having instruments compared with our standards, for which no extra charge is made, still continues to induce many private persons, institutions of learning, &c., whose voluntary work is of great benefit to this service, to purchase instruments through this office; and during the year there have been two hundred and eighty instruments of various kinds purchased, representing a total cost of $1,907.25.

These transactions have no connection with the public funds disbursed by the property and disbursing officer of this service. This office simply acts as the agent of the manufacturer.

There have been 1,251 instruments of various kinds purchased during the year for the use of this service, and 1,859 instruments have been issued since the last report.

The condition of the appropriations (disbursed by this office) for the fiscal year ending June 30, 1886, with expenditures thereunder and balances, with probable demands on such balances, as required to be rendered by the act of Congress approved May 1, 1879, is as follows:

	Apppropriated.	Expended.	Balances.	Probable demands.
Observation and report of storms	$246,000 00	$96,019 72	$149,980 28	$126,980 28
Signal Service	5,500 00	2,511 32	2,988 68	2,988 68
Maintenance and repair of military telegraph lines	24,000 00	20,263 53	3,736 47	3,736 47

The amounts appropriated under the different heads for the support of the Signal Service, U. S. Army, for the fiscal year ending June 30, 1886, are as follows:

Legislative, executive, and judicial:	
Regular clerks, messengers, &c	$10,660 00
Scientific experts, clerks, &c	40,000 00
Postage-stamps, postal union countries, allotted by the Secretary of War	1,069 00
Stationery, allotted by the Secretary of War	4,108 00
Rent of buildings for Signal Office	7,500 00
Contingent expenses, allotted by the Secretary of War	7,417 49
Total	70,754 49

Sundry civil expenses:	
Observation and report of storms;	
Manufacture, purchase, and repair of instruments	$10,000 00
Telegraphing reports	138,000 00
Expenses, storm signals	11,000 00
Cotton-belt reports	7,000 00
Connection life-saving stations	1,500 00
Instrument shelters	2,000 00
Rents, &c., of offices outside of Washington	41,500 00
River and flood reports	10,000 00
Maps and bulletins	25,000 00
Total	246,000 00
Maintenance and repair of military telegraph lines	24,000 00
Pay, &c., of the Signal Corps:	
Pay of officers	33,750 00
Pay of enlisted men	200,151 51
Mileage to officers	5,000 00
Commutation of quarters to officers	7,200 00
Pay of contract surgeons	1,200 00
Total	247,301 51
Subsistence Department:	
Subsistence and commutation of rations, Signal Corps	155,000 00
Quartermaster's Department:	
Regular supplies—	
Fuel	6,200 00
Commutation of fuel at $9 per month	23,760 00
Commutation of fuel at $8 per month	23,040 00
Forage for mules and horses	3,100 00
Forage for officers' horses	1,495 00
Stationery	100 00
Stoves, and repairs to heating apparatus	400 00
Lights	150 00
Straw for officers' horses	109 20
Straw for animals	217 00
Straw for bedding	67 20
Total	58,638 40
Incidental expenses—	
Horse and mule shoes	500 00
Shoes and shoeing of officers' horses	234 00
Blacksmith's and other tools	300 00
Veterinary supplies	300 00
Fire apparatus, disinfectants, &c	200 00
Office furniture, Fort Myer	100 00
Total	1,634 00
Interment of officers and men	200 00
Apprehension of deserters	120 00
Transportation—	
Materials and funds	25,000 00
Officers and men	8,875 00
Means of, mules	1,000 00
Means of, harness	130 00
Means of, repairs to	500 00
Total	35,505 00

Sundry civil expenses—Continued.	
Quartermaster's Department—Continued.	
Barracks and quarters—	
Commutation of quarters	$84,108 00
Work and supplies for Fort Myer	1,500 00
Total	85,608 00
Clothing and camp and garrison equipage—	
Six wall-tents, &c	73 89
Issues in kind	2,800 00
Total	2,873 89
Medical Department:	
Medical attendance and medicines, officers and men, Signal Corps	5,000 00
Medical attendance and medicine, officers with Signal Corps	100 00
Medical and hospital supplies, Fort Myer	700 00
Medicines from depots, &c	1,000 00
Materials, repairs to hospital, Fort Myer	300 00
Total	7,100 00
Ordnance, &c., Fort Myer	100 00
Printing and binding, allotted by the Secretary of War	14,000 00
Support of the Army:	
Expenses Signal Service, U. S. Army	5,500 00
Grand total	954,335 29

There is always an accumulation at this office of valuable Government property, and I would invite the attention of the Secretary of War to the very inadequate storehouse, and recommend that, if possible, some action may be taken to furnish storage-room of a better character and greater capacity.

It would seem that while several estimates have been submitted for a fire-proof building they have been thus far ignored, and the accumulated original records of the service, the result of the observations made, together with the valuable property, is worth protection. Congress should be urged to favorably consider the estimate submitted for a fire-proof building adapted to the needs of this service.

The work of the Bureau in this city now necessarily occupies ten buildings, so located as to require a larger force of messengers and laborers than would be required were this work brought into a single convenient building. The rent now paid for these buildings is $6,379.96 per year. A suitable building for the work of this service is located on the corner of 24th and M streets, northwest, with about 54,000 square feet of ground, owned by Mr. Ferguson, and may be purchased at the reasonable cost of $108,000, and I recommend that an appropriation of this amount be made for the purchase of this building and grounds, and also that an appropriation of $42,000 be made for the erection of the necessary storehouses on said ground for this service.

PROPERTY AND DISBURSEMENTS.

The improved methods of administering the duties of the Property and Disbursing Division of this office have continued, with gratifying results, and the accounts passed the scrutiny of the accounting officer of the Treasury with few suspensions, and these have been for a technical informality. All vouchers are paid by checks drawn to order and in no case to bearer; this mode being considered the safest, not

only in transmitting money, but it also furnishes the assurance that the money reaches the person for whom it is intended. All requisitions are carefully scrutinized before payment by a disinterested officer. The methods of verifying and settling accounts in this Bureau are those prescribed by the Army Regulations and are identical with those which govern in the Quartermaster's Department of the Army, with the additional check that these accounts pass the scrutiny of the Examining Division of this office before they are submitted to the accounting officer of the Treasury.

The service has been economically managed, and the additional care of the property, which is widely distributed over the country, has greatly increased the work of the division. Under the present rule each article purchased is taken up on a property report, which is rendered quarterly for transmission to the Third Auditor of the Treasury, so that there is not one article, from the merest trifle to the most expensive instrument that is purchased, but what is carefully reported to the accounting officer of the Treasury.

The experience of the past year furnishes additional reasons for renewing my recommendation for the erection of a fire-proof building for offices suitable for the use of the Signal Service, as per plans and estimates contained in Senate Ex. Doc. No. 152, Forty-eighth Congress, first session, unless the Ferguson property be bought. The buildings now occupied by this service are insecure, unsafe for the storage of valuable property, and in every way unsuited to its use.

The annual report of Capt. Francis B. Jones, A. Q. M., U. S. A., property and disbursing officer of the Signal Service, will accompany this report as an appendix.

PUBLICATIONS.

The "Monthly Weather Review" of the Signal Service has been regularly published during the year, and this publication is now recognized as one of the most valuable productions of the service. Each "Review" contains a general summary of the meteorological data collected at this office during the month; new features have been added, and improvements made during the year, which render this publication more complete. Charts are published with this "Review," showing the movement of storms over the United States and the North Atlantic Ocean, which are of special value to shipmasters.

The "Monthly Summary and Review of International Observations," based upon the data collected by mail without expense to this service, and containing the general weather conditions of the northern hemisphere, has also been published.

Work has also been continued on the publication known as the "Meteorological Record," and by special authority of the Secretary of War the printing of this work for a single year has been continued and is near completion, bringing it up to November, 1878. This record is of special value in the study of storm-movements in the United States, and some provision should be made for completing the printing of the full series.

The publications known as Professional Papers and Signal Service Notes previously issued by this service have been discontinued, in compliance with the law forbidding the publication of such papers as are not required for the current work of this service. In this connection I would say that the best results from this current work can only be attained by a careful study of the observations collected, upon which

such work is based, and therefore the discussions and generalizations by competent students have a direct bearing upon the current work of this service, and some provision should be made for the publication of such papers.

ORGANIZATION OF THE SIGNAL CORPS.

The necessity for grades of rank in every military organization has been recognized from time beyond record, and good men cannot be retained in the service which offers no reward for long and efficient work.

By retaining the experience of officers who have served for long periods in this service great economies can be secured each year and serious mistakes avoided.

The recommendation of the Joint Commission of Congress investigating the Signal Service, relative to officers of long experience, should receive the approval of Congress, and some provision be made for the promotion of the officers of the Signal Corps, based upon length of service and ability to perform the duties which may be required of signal officers.

I am, very respectfully, your obedient servant,

W. B. HAZEN,

Brig. and Bvt. Maj. Gen., Chief Signal Officer, U. S. A.

Hon. WILLIAM C. ENDICOTT,

Secretary of War.

LIST OF APPENDICES ACCOMPANYING THE REPORT OF THE CHIEF SIGNAL OFFICER OF THE ARMY FOR THE YEAR ENDING JUNE 30, 1886.

1.—Report of the officer in charge of the division of military signaling.
2.—Rules and regulations of the indications division.
3.—Report on State weather services.
4.—Report on cold-wave signals.
5.—Report upon weather signals.
6.—Report of the officer in charge of the Pacific coast division of the Signal Service.
7.—Report upon the system of cotton-region observations.
8.—Report on the display of signals for the protection of marine interests.
9.—River reports and flood warnings.
10.—Railway weather-bulletin service.
11.—Report of officer in charge of the correspondence and records division.
12.—Annual report of the officer in charge of the stations division.
13.—Annual report of the officer in charge of the telegraph division.
14.—Annual report of the property and disbursing officer.
15.—Annual report of the examining officer.
16.—Annual report of the officer in charge of the publications division.
17.—Annual report of the officer in charge of the meteorological record division.
18.—Report of tornado work.
19.—Report of the assistant in charge of the study-room division.
20.—Report of officer in charge of the fact and international bulletin division.
21.—Annual report of Signal Service agencies.
22.—Annual report of the assistant in charge of the physical laboratory division.
23.—Report of Professor William Ferrel, assistant, on the reduction of barometric pressure to sea-level and standard gravity.
24.—Report of Professor William Ferrel, assistant, psychrometric tables for use in the Signal Service.
25.—Report of junior Professor H. A. Hazen, Signal Service, on thunder-storms.
26.—Instructions to voluntary observers of the Signal Service.
27.—Classified list of stations of the Signal Service.
28.—Annual meteorological summaries (forms 122 B) at stations of the Signal Service.
29.—Table showing mean range of atmospheric pressure at stations of the Signal Service.
30.—Table showing mean of maximum and mean of minimum temperatures at stations of the Signal Service.
31.—Table showing mean monthly temperatures and departures of 188[illegible] therefrom at stations of the Signal Service.
32.—Tables showing mean daily range of temperature at stations of the Signal Service.
33.—Table showing monthly and annual mean temperatures at volunteer stations.
34.—Table showing monthly maximum and minimum temperatures and annual range of temperature.
35.—Table showing the monthly maximum and minimum temperatures and the annual range of temperature at military post hospitals.
36.—Table showing monthly and annual mean temperatures at military post hospitals.
37.—Table showing monthly and annual mean temperatures at stations on the Central Pacific and Southern Pacific Railroads.
38.—Table showing monthly maximum and minimum temperatures and annual range of temperature at stations on the Central Pacific and Southern Pacific Railroads.
39.—Table showing the mean of the maximum and minimum temperatures of the cotton-region stations of the Signal Service.
40.—Table showing the average temperature of the surface of the ocean at stations of the Signal Service.
41.—Table showing the normal precipitation and the departures of that for 1885 therefrom at stations of Signal Service.
42.—Table showing the monthly and annual precipitation at volunteer stations of the Signal Service.

43.—Table showing the monthly and annual precipitation at military post hospitals.
44.—Table showing the monthly and annual precipitation at stations on the Central Pacific and Southern Pacific Railroads.
45.—Table showing precipitation at the cotton-region stations of the Signal Service.
46.—Table showing the monthly maximum and minimum temperatures and precipitation at third-order stations of Signal Service.
47.—Table showing the mean maximum and mean minimum temperatures and the number of days of precipitation at third-order stations of the Signal Service.
48.—Table showing the mean relative humidity at stations of the Signal Service.
49.—Table showing dates of first frost at stations of the Signal Service east of the Rocky Mountains for the winter of 1885–'86.
50.—Table showing date of the last frost at stations of the Signal Service east of the Rocky Mountains for the winter of 1885–'86.
51.—Table showing the average movement of the wind at stations of the Signal Service.
52.—Table showing average cloudiness at stations of the Signal Service.
53.—Table showing the average number of clear, fair, and cloudy days at stations of the Signal Service.
54.—Table showing the dates of closing of navigation on lakes and rivers at selected stations of the Signal Service.
55.—Table showing the dates of opening of navigation on lakes and rivers at selected stations of the Signal Service.

APPENDIX 1.

REPORT OF THE OFFICER IN CHARGE OF THE DIVISION OF MILITARY SIGNALING.

SIGNAL OFFICE, WAR DEPARTMENT,
Washington City, July 4, 1886.

SIR: I have the honor to submit the following report of the operations of the military signaling division for the year ending June 30, 1886: On the recommendation of the Chief Signal Officer, the Adjutant-General issued orders (General Orders, No. 109, 1885) on October 12, directing that instructions be given and practice had in military signaling at all military posts, and that monthly reports be rendered to the Chief Signal Officer. Suitable forms for reports were at once prepared, and a supply sent to each acting signal officer. At this office the practice in field signaling was continued until November 1, a daily detail being made for that purpose. A company of thirty carefully selected men was enlisted for the purpose of making them experts in all kinds of signaling, and having them ready at a moment's notice for field duty. This company is now under instruction at Fort Myer, except two of its members, who are serving in Arizona with General Miles. During the latter part of 1885, the advisability of adopting a new code suitable to all kinds of visual signaling was considered, and on recommendation of the Chief Signal Officer a board was appointed, consisting of the Chief Signal Officers of the Army and of the Navy, and other officers, to select a suitable code. As a result the Continental Morse Code was adopted in orders from the Adjutant-General's Office for use in and between the Army and Navy. The same order prohibited the use of any other code.

New code-cards were at once issued to the Army and Navy, and a new cipher disk (also adopted upon the recommendation of the board) was supplied to both services.

During the year many experiments and tests were made with a view of improving on the old signal equipments, and upon the recommendation of the Chief Signal Officer, a board, consisting of Major Volkmar, Lieutenant Dunwoody, and Lieutenant Maxfield, was appointed to consider and report upon new equipments devised by Lieut. B. M. Purssell, Signal Corps. After several severe tests, the board found these new equipments were in many respects superior to the old, but was not willing to recommend their adoption until fully tested by actual use in the field. On the recommendation of this board 25 sets of the new equipments are now in course of construction, and will be sent to the different military headquarters for final test.

The manuscript of a new manual of signals was prepared early in the fiscal year, but it cannot be submitted for action until the question of the adoption of new equipments is finally settled.

During the year 346 requisitions for signal equipments, stores, &c., were received and action taken thereon. The issues to military posts consisted of:

Kit cases	No..	62
4-foot flags	do..	218
2-foot flags	do..	42
Jointed staffs	do..	127
Haversacks, pliers, and scissors	do..	73
Canteens and funnels	do..	58
Flying and foot torches, together with the necessary extinguishers, flame-shades, and wormers	No..	62
Manuals of signals	do..	35
Wands	do..	294
Balls of wicking	do..	685
Boxes of matches	do..	253
5-gallon oil-cans	do..	2
Oil	gallons..	193
Telescopes	No..	42

Marine-glasses	No..	19
Heliographs	do..	19
Sounders	do..	66
Keys	do..	62
Relays	do..	8
Switch-board	do..	1
Lightning arresters	do..	3
Telephones	do..	11
Pairs climbers	do..	2
Cutting-pliers	do..	13
Vices	do..	3
Double connectors	do..	12
Wrench	do..	1
Electric call-bells	do..	20
Transmitters	do..	2
Galvanized and insulated wire (about)	feet..	56,000
Eagle (round) batteries	No..	117
Leclanché cells	do..	10
Sulphate of copper	pounds..	609
Sal Amoniac	do..	27
Extra zincs	No..	73
Insulators	do..	723
Insulator brackets	do..	541
Spikes	do..	50
Compasses	do..	2
Anemometer	do..	1
Camp-stools	do..	4

In addition to the above there were sent to General N. A. Miles, commanding Department of Arizona, during the months of May and June, 34 heliographs, 10 telescopes, 30 marine glasses, and 1 aneroid barometer. These were sent partly from this office and partly from military posts. Eleven men were also ordered to report to him for purposes of signaling in connection with his Indian campaign.

During the year 669 reports of instruction and practice in military signaling were received from military posts.

The following is a summarized statement of the number of officers and men who received instruction in military signaling at the various military posts since the month of March, when the instruction in the new code, referred to above, began:

Departments—Posts.	March.		April.		May.		June.	
	Officers.	Men.	Officers.	Men.	Officers.	Men.	Officers.	Men.
Department of the East:								
Wayne, Mich.	3	8	2	5	2	5	2	5
Brady, Mich.	0	0	0	0	0	0	0	13
Mackinac, Mich.	0	18	0	8	0	3	0	[c]3
Porter, N. Y.	1	4	1	4	1	4	1	4
Niagara, N. Y.	0	0	0	6	0	6	0	6
Ontario, N. Y.	0	8	0	3	0	8	0	3
Madison Barracks, N. Y.	0	18	0	18	0	18	0	17
Plattsburg Barracks, N. Y.	0	9	0	6	0	8	0	7
Preble, Me.	0	7	0	8	0	6	0	5
Warren, Mass.	0	4	0	6	0	6	0	9
Adams, R. I.	2	10	2	11	2	10	2	10
Trumbull, Conn	0	2	0	6	0	6	0	4
Hamilton, New York Harbor	[b]	[b]	[b]	[b]	1	8	2	7
Wadsworth, N. Y.	0	4	0	4	0	4	0	8
Columbus, New York Harbor	1	11	1	11	1	11	1	11
Schuyler, New York Harbor	1	4	1	4	1	4	1	4
McHenry, Md.	[a]	[a]	0	[c]3	0	[c]3	0	[c]3
Washington Barracks, D. C.	1	5	1	5	1	5	1	5
Monroe, Va.	0	0	19	0	0	89	0	33
Saint Francis Barracks, Fla.	2	8	2	4	2	8	2	4
Barrancas, Fla.	0	8	0	8	0	16	0	14
Mount Vernon Barracks, Ala.	1	8	1	8	1	5	1	8
Jackson Barracks, La.	0	6	0	6	0	5	0	4
Little Rock Barracks, Ark.	1	4	1	4	1	4	2	8
Newport Barracks, Ky	0	6	0	21	0	6	0	5

[a]. Also two companies. [b]. Entire command. [c]. Batteries D, G and I.

Departments—Posts.								
Department of Dakota:								
Abraham Lincoln, Dak	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Bennett, Dak	0	0	0	3	0	2	0	3
Meade, Dak	1	8	1	8	1	5	1	10
Buford, Dak	2	4	2	6	1	6	0	4
Custer, Mont	0	0	1 c	3	a	a	1	3
Keogh, Mont	3	12	3	15	2	8	2	9
Pembina, Dak	0	6	0	21	0	21	0	23
Randall, Dak	0	3	0	8	0	7	0	8
Sisseton, Dak	0	0	0	0	1	3	1	3
Poplar River, Mont	3	14	3	14	3	13	3	15
Snelling, Minn	0	17	0	17	0	17	0	15
Sully, Dak	0	4	0	4	0	4	0	4
Totten, Dak	0	4	0	4	0	8	0	8
Yates, Dak	0	0	0	0	0	10	a	a
Maginnis, Mont	0	0	0	0	1	5	1	5
Assinnaboine, Mont	3	0	0	0	2	3	2	6
Ellis, Mont	0	6	0	6	0	6	0	5
Missoula, Mont	1	3	1	3	1	3	1	3
Shaw, Mont	2	8	2	8	2	7	2	5
Department of the Platte:								
Bridger, Wyo	1	6	1	6	1	6	1	6
D. A. Russell, Wyo	2	8	4	16	4	16	a	a
Douglas, Utah	0	0	b	b	0	4	0	4
Fred Steele, Wyo	1	3	1	3	2	6	2	6
Laramie, Wyo	0	0	0	0	0	0	0	0
McKinney, Wyo	0	0	a	a	a	a	a	a
Niobrara, Nebr	0	14	0	14	0	14	0	0
Omaha, Nebr	1	12	1	12	0	12	0	0
Robinson, Nebr	0	4	0	4	0	4	0	4
Sidney, Nebr	2	7	2	6	2	7	2	7
Washakie, Wyo	1	6	1	6	1	6	1	6
Department of the Missouri:								
Elliott, Tex	7	11	7	11	0	5	a	a
Gibson, Ind. T	0	6	0	6	0	6	0	6
Reno, Ind. T	0	7	0	7	0	9	0	7
Riley, Kans	0	0	0	0	0	0	0	0
Sill, Ind. T	1	6	1	6	0	4	0	6
Supply, Ind. T	1	3	0	3	1	3	1	8
Hays, Kans	0	9	0	7	0	7	0	7
Leavenworth, Kans	0	9	0	10	0	10	0	10
Lyon, Colo	0	0	0	0	0	0	0	0
Cantonment on Uncompahgre, Colo	0	0	0	0	0	0	1 c	3
Department of Arizona:								
Bayard, N. Mex	0	0	0	0	0	0	a	a
Bliss, Tex	0	17	0	0	0	0	a	a
Marcy, N. Mex	0	0	0	0	0	6	a	a
Selden, N. Mex	0	6	0	6	0	6	a	a
Union, N. Mex	4	6	3	6	2	3	a	a
Lewis, Colo	1	8	1	8	1	8	a	a
Stanton, N. Mex	0	4	0	4	0	0	a	a
Wingate, N. Mex	2	5	2	8	2	5	a	a
Apache, Ariz	0	3	0	0	0	0	a	a
Bowie, Ariz	0	0	0	0	0	0	a	a
Grant, Ariz	0	0	0	0	a	a	a	a
Huachuca, Ariz	0	0	0	6	0	26	a	a
Lowell, Ariz	a	a	0	0	0	0	a	a
McDowell, Ariz	0	0	0	0	0	0	a	a
Mojave, Ariz	0	4	0	4	0	4	0	4
Thomas, Ariz	0	0	0	0	0	0	0	0
Verde, Ariz	0	3	0	3	0	3	a	a
Whipple Barracks, Ariz	0	0	0	3	0	3	a	a
Department of Texas:								
Brown, Tex	1	10	1	9	1	8	0	0
Clark, Tex	2	6	2	6	2	6	1	4
Concho, Tex	0	0	0	0	0	0	0	0
Davis, Tex	0	0	0	0	0	0	0	0
Del Rio, Tex	0	0	0	0	0	0	1	10
McIntosh, Tex	0	0	0	0	0	0	0	0
Peña Colorado, Tex	0	0	0	0	0	0	0	0
Hancock, Tex	0	4	0	4	0	4	0	4
Ringgold, Tex	0	0	0	0	0	0	0	0
Stockton, Tex	0	0	0	0	0	4	a	a
San Antonio, Tex	0	0	0	0	0	0	0	0

a. Reports missing.
b. All officers and non-commissioned officers.
c. Instruction had, but no names given.

Departments—Posts.	March.		April.		May.		June.	
	Officers.	Men.	Officers.	Men.	Officers.	Men.	Officers.	Men.
Department of Columbia:								
Boisé Barracks, Idaho	0	0	0	0	0	0	0	0
Canby, Wash. T	0	4	0	4	0	7	0	6
Cœur d'Alene, Idaho	1	12	1	11	1	10	[a]	[a]
Klamath, Oreg	0	8	0	8	0	0	0	0
Spokane, Wash. T	0	0	2	8	1	8	[a]	[a]
Townsend, Wash. T	1	8	1	8	0	8	2	8
Vancouver Barracks, Wash. T	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]
Walla Walla, Wash. T	0	0	0	0	0	0	0	5
Department of California.								
Alcatraz Island, Cal	0	0	0	11	0	12	0	0
Angel Island, Cal	0	0	0	0	0	0	0	0
Benicia Barracks, Cal	0	8	0	8	0	8	0	8
Bidwell, Cal	0	8	0	4	0	4	0	2
Gaston, Cal	[b]	[b]	[b]	[b]	[b]	[b]	[b]	[b]
Halleck, Nev	0	0	0	0	0	0	0	0
McDermit, Nev	0	8	0	12	0	15	0	8
Winfield Scott, Cal	0	0	0	4	0	8	0	14
Mason, Cal	0	6	0	6	0	10	0	9
Presidio of San Francisco, Cal	0	6	0	8	0	6	0	5
San Diego Barracks, Cal	0	0	0	0	0	0	0	0
West Point, N. Y	0	0	[c] 66	0	0	0	0	0
Willets Point, N. Y	2	27	2	26	0	0	0	0
Myer, Va	0	42	0	41	0	41	[d]	[d]

[a]. Reports missing.
[b]. Instruction in old code.
[c]. Cadets.
[d]. All officers and men practicing in field.

Much valuable information was collected from abroad during the year in regard to military signaling, and fourteen translations were made from German, French, and Danish papers upon that subject.

Very respectfully, your obedient servant,

B. M. PURSSELL,
Second Lieutenant, Signal Corps, U. S. A.

The CHIEF SIGNAL OFFICER U. S. ARMY.

OFFICE CHIEF SIGNAL OFFICER, *August* 6, 1886.

In view of the failure of Congress to provide for the maintenance of the school of military signaling at Fort Myer, Virginia, during the current year, I submit the following postscript to my report dated July 4, 1886:

With the abolishment of Fort Myer, Va., as a school of instruction for the Signal Service, the Army has been deprived of the means to properly maintain and improve this important branch of the service. Every civilized nation recognizes the necessity of an organized field telegraph for strategic and tactical purposes of modern warfare, and it is urgently recommended that the post again be placed under the control of the Chief Signal Officer, not only for the purpose of instructing the enlisted force of this service in its meteorological duties, but mainly because Fort Myer offers great facilities for the maintenance and further improvement of the field telegraph and visual signaling. The German general, von Chauvin, fully recognized the necessity of an organized signal corps when he said: "As every other branch of the army intended for military actions marches to the battle-field fully prepared by uninterrupted drills in time of peace, the same must be done in case of the field telegraph. All arms are being perfected, and are increased, and the same care must be bestowed upon the field telegraph. From experiences in the last campaign (Franco-Prussian war, 1870–'71), and in view of the progress of other armies, the necessity of organizing, in peace time, a field telegraph corps shows itself forcibly, and in this way only can the field telegraph succeed in complying with the materially increased requirements of modern warfare." It cannot be denied that a neglect of this branch of the military service may have serious consequences, which would be keenly felt should the United States become involved in any conflict with foreign powers. Below I propose to show briefly the organization of the military telegraph of foreign powers and improvements made by them to keep abreast with the times.

It will be observed that the organization of the military field telegraph differs in different countries. Thus, for instance, Spain, inclosed by chains of mountains, has intro-

duced and organized a mountain telegraph, *i. e.*, the telegraphic supplies are transported by mules instead of wagons, as is done in more level countries; and the topographical conditions of Austria require for the Austrian field telegraph formation the greatest diversity. We find, therefore, in that country not only permanent and semi-permanent lines, but also field and mountain telegraph systems, including the optical and acoustic telegraph. Other causes of variation in the organization are found in the systems of recruiting. In countries where the government has control of the state telegraph the *personnel* is recruited from the operators, while some countries have purely military and others a mixed *personnel.*

France.—In this country the field telegraph corps is formed only with the outbreak of a war. The management of the whole is conducted by officials of the state telegraph, and the necessary work is done by civilians without the assistance of officers. Soldiers are only used as train escorts and patrols. Only such civilians are recruited from the state telegraph as belong to the reserve of the army; they are subject to military law and have all rights and duties in common with the soldier. The field telegraph director-general is under the orders of the commander-in-chief of the army and is stationed at headquarters. Upon mobilizing the army a field telegraph corps is at once organized for each army corps, and comprises the following elements:

1. Field telegraph direction.
2. Field and mountain telegraph sections.
3. Semi-permanent telegraph sections.
4. Means of transport which may be furnished by the proper military authorities.
5. Sufficient *personnel* and material for the service of state, fortification, field, and reserve lines.

The sections of the field and mountain telegraph and six sections of the semi-permanent telegraph are permanently organized, but are only mobilized in case of war, and take part in the great maneuvers of the army corps by direction of the secretary of war. The former sections are charged with the maintenance of telegraphic communication between operating bodies of troops, and the latter's duties consist in connecting the field lines with the state telegraph. The number of sections to be attached to a singly operating army depends upon the strength of the army, but each section consists of one chief of section, three chiefs of station, nine operators, and twenty-six laborers.

Lately important progress has been made in the advance-post-telegraph service, and forty cavalrymen are sent each year to the school at Saumur to be instructed in military telegraphy. These men are selected after examination in reading, writing, and arithmetic, and receive, after having faithfully served their enlistment, an appointment in the state telegraph department, to be again taken into service in the field telegraph at the outbreak of a war. In addition to this school of instruction for enlisted men, a new branch of military telegraphy has but recently been added to the course for officers at the "École Militaire Supérieure."

Austria.—Austria was one of the first countries to create a field telegraph. As early as 1852 and 1853 the war department had a field-telegraph-station wagon constructed which took part in the military exercises. The management of the field telegraph is under supervision of officials of the state telegraph, who also perform the station duty, and soldiers were used for the transport of material and building of lines; but this organization was modified by an imperial order in 1883, which created a regiment of railways and field telegraphs. In time of peace this regiment consists of two battalions of four companies each, and eighteen non-commissioned officers and soldiers of each of these companies and about twenty volunteers of one year are in each year especially prepared for the telegraph service. In case of war this regiment is organized as follows:

Three directions of field telegraph of the first line.
Three directions of field telegraph of the second line.
Forty-three sections of field telegraph.
Three sections of mountain telegraph.

Seven companies of the regiment form forty-two sections of field telegraph, and the eighth company forms one field section and three mountain sections. These latter three sections operate in mountainous countries, and telegraph material is carried by pack animals. Each field section comprises 1 officer and 52 enlisted men, and each mountain section 1 officer and 30 enlisted men. Each direction of the first line consists of 2 officers and 4 men (1 operator and 3 orderlies), and each of the second line of 2 officers and 3 men (1 operator and 2 orderlies), while the whole is under supervision of a director of telegraphs, with a captain as assistant.

Germany.—The organization of the military telegraph in Germany resembles much that described for France. There are no special troops as operators, and in time of war this service is performed by employés of the telegraph department; but the lines are built by pioneer soldiers, and the supervision of the line-works is in the hands of engineer officers. At the outbreak of the Franco-Prussian war in July, 1870, there were in Prussia 4 field and 3 semi-permanent telegraph divisions; these, however, were soon found

to be insufficient, and 3 additional field and 2 semi-permanent telegraph divisions were formed. Including the Bavarian and Wurtemburgian telegraph troops, the entire corps consisted of 10 field and 5 semi-permanent telegraph divisions. In the Prussian army each field telegraph division consisted of 4 officers, 1 surgeon, 7 civilian operators, and 135 non-commissioned officers and privates; each semi-permanent field telegraph division consisted of 2 officers, 21 civilians of the state telegraph, 24 laborers, and 87 non-commissioned officers and privates. This corps in the short space from June 16, 1870, to August 10, 1871, constructed 1,785 kilometers of field lines, 804 kilometers permanent, and reconstructed 8,285 kilometers of telegraph lines, and the number of stations established amounted to 611. Since then 50 complete advance-post telegraphs, at present used for fortification service, have been introduced, and a war telegraph inspection created. This permanent inspection of the military telegraph is stationed at Berlin, and consists of a colonel, a major, and 4 engineer officers. It has charge of the telegraph material, testing of new inventions, study of the organizations of foreign military telegraphs and kindred subjects.

In 1875 the total *personnel* of the field-telegraph column consisted of 36 engineer officers, 12 train officers, 84 telegraph officials, 1,080 pioneers, and 600 train soldiers; adding to this the surgeons and laborers, the total strength would be nearly 2,000 men.

Russia.—This country has a permanent telegraph corps, which is completed at the outbreak of a war. Civilians of the state telegraph are only used in the second and third line of the field telegraph. In 1873, when the army was reorganized, seven field telegraph parks were created, stationed at St. Petersburg, Warsaw, Riga, Tiflis, and Kiew. Each park consists of 3 divisions, viz, 1, flying division; 2, semi-permanent division; and, 3, reserve division; and each division has a strength of 1 officer, 3 non-commissioned officers, and 35 privates. The organization of a galvanic service of the engineer corps in 1884 proves the great appreciation in which the telegraph is held in higher military circles. This service examines all discoveries and inventions relating to telegraphs, mines, and torpedoes, and gives advice upon their adoption for army use.

England.—Civilians are entirely excluded from the organization of the field telegraph. The permanent corps is formed of Division C of the Royal Engineers, and is called "Royal Engineer Telegraph Corps." Besides this corps, two companies of the Royal Engineers are always under instruction in telegraphy at the Chatham Telegraph School. The corps is stationed at Aldershot, and is exercised daily in train drill and station duty, and takes part in the maneuvers. It consists of 6 officers and 245 men. Strategically, the English field telegraph is divided into four well-defined branches:

1. State and fortification telegraph.
2. Semi-permanent telegraph.
3. Field telegraph.
4. Visual signals with flags, torches, lights, &c.

The troops receive thorough instruction in telegraphy in all its branches at the school at Chatham. From March, 1869, to April, 1872, 209 officers and 322 men received a course of instruction at this school.

Spain.—Until 1876 the telegraph service in the Spanish army was performed by civil employés, but at this time a new regiment (*El Regimiento Montado*) was formed from the then existing engineer troop, consisting of pontoneers, railway troops, and the field telegraph *personnel.*

The "*Regimiento Montado*" is divided into two battalions of four companies each. Two companies of the second battalion form the field telegraph corps, each having a strength of 4 officers and 233 men. Each company is divided into four sections, and the eight sections of the telegraph corps carry sufficient material (upon the backs of pack-animals) to construct a cable line of 220 kilometers in length, and to establish 32 telegraph, 32 heliograph, 40 acoustic, and 8 advance-post stations.

The recruits, after enlistment, have to undergo a practical and theoretical course of instruction in electric and visual telegraphy until fitted for the duties required of them.

Belgium.—The Belgian field-telegraph corps is composed of two companies, each consisting of 4 officers and 81 men, which force, in case of war, is increased to 209 men. One of these companies has charge of the state lines, which during war may be taken for military purposes, and the other has charge of the field telegraph. The term of service of these operators is three years, and during this time the men receive constantly thorough practical and theoretical instruction in the different branches of their service.

Holland.—The Dutch army has a battalion of sappers and miners of eight companies, one of which is a company of railways and telegraphs and constitutes the telegraph and signal corps of Holland. This company, in time of peace, consists of 6 officers and 184 men, and, when mobilized, is increased by recruiting from volunteers and

employés of the state telegraph, who must be acquainted with the manipulation of telegraph instruments and optical signals.

Italy.—The military telegraph service of Italy consists of six companies of the regular army, divided into two divisions of three companies each, and of two companies of militia-men, the whole belonging to the third regiment of engineers.

Each company, in time of peace, consists of 4 officers and 112 men, which numbers are increased to 6 and 250 respectively, when the company is placed on war footing. One of these companies is stationed at Rome and the five others at Florence, and each receives annually special technical instructions in telegraphy.

Sweden.—In 1871 a field-telegraph corps was created in Sweden, consisting of one company, after experiments had been made in the two preceding years by the engineer corps as to the telegraph material most suitable for the circumstances of that army. This signal company is stationed at Stockholm and consists of 4 officers and 124 men. When placed on war footing as many subdivisions are made as may be required, but each will have a strength of 1 officer and 77 men. The training of the telegraph soldier consists of a general military, technical, and mental culture, besides of drilling in the duties of the trained soldier, namely:

(*a*) General military training consists of general military service and army organization; sanitary instruction; infantry drill; science of arms and target practice; marching; gymnastics and guard duty.

(*b*) Technical training consists of practical geometry, mechanics, and surveys; pioneer service and field-telegraph service.

(*c*) Mental training consists of reading, writing, and arithmetic.

Portugal.—According to the military law promulgated in 1884, the Portuguese army comprises a regiment of engineer troops, consisting of two active battalions of four companies each, and one reserve battalion, also containing four companies. The second company of the second battalion constitutes the telegraph corps of the Portuguese army. The operators of this company are, when in the field, placed directly under the orders of the commander-in-chief.

Switzerland.—The military telegraph service in Switzerland is performed by the engineer corps, consisting of eight battalions. Each of them constitutes a company, which is divided into two sections, namely: that of telegraphs and that of railways. The duties of the former consist in establishing and manning field-telegraph lines, and those of the latter in the destruction and rebuilding of railways. The *personnel* of a telegraph section comprises 2 officers and 38 men, including 9 operators, and carries sufficient material for the construction of 20 kilometers of line.

Turkey.—During the Turko-Russian war Turkey had no organization for a military-telegraph service, and civilian employés performed that duty; but in 1882 a German envoy was sent to Constantinople at the request of the Turkish Government, with a view to reorganize the Turkish army. According to the proposed reorganization the Turkish army was to consist of thirteen army corps, each containing one telegraph company. It is not known, however, at this writing, whether this proposed reform went into effect.

Roumania.—The engineer troops of the Roumanian army comprise four battalions of five companies each. The first company of each battalion constitutes the telegraph and railway company. The administrations of telegraphs designates the force and material necessary to complete the telegraph sections at the breaking out of a war, and the *personnel* is recruited from the reserve and from the militia.

Servia.—The successive transformations in the Servian army since the Turko-Russian war, have always had a tendency to increase the military force of the new kingdom. When, therefore, the army was reorganized with the beginning of the year 1883, the force of the standing army, which was 9,524, was a little more than doubled. In case of war, the call upon the reserve increases the army of the first line to about 107,000 men, and to this army there are assigned two telegraph sections, which are formed at the moment of mobilization.

Greece.—According to the laws of 1881, regulating the organization of the Greek army, the telegraph duty in the field is performed by 18 civilian employés attached to the command of the army.

Norway.—There is at present no regularly organized field telegraph or signal corps in Norway, and the duties pertaining to that branch of service are performed by the engineer brigade.

British India.—In India there exists a permanent military telegraph company which at the breaking out of a war is completed by qualified military operators who have received instruction either in England or India, and by state telegraph officials, and this force is regulated according to circumstances and the needs of the service. Much use is made of optical signals, flags by day, torches by night; and heliograph by day and night have been found very valuable in the Indian campaigns, and the troops of all the regiments are instructed in these duties.

Japan.—The field telegraph corps of the Japanese army was first organized in 1880 and placed under the control of the general staff. According to the present form of organization operators and men are chosen from among volunteers only who have passed the required examination, and the term of service is seven years. The operators and line-men, after entry into the service, receive a special course of instruction, that of the former lasting one year and that of the latter six months. This corps has also charge of the transmission of military messages by means of optical telegraphy. The total force of this corps, including officers, reaches 207, which number is increased to 373 in time of war.

APPENDIX 2.

RULES AND REGULATIONS FOR THE INDICATIONS DIVISION.

INSTRUCTIONS }
No. 34. }

SIGNAL OFFICE, WAR DEPARTMENT,
Washington, July 15, 1886.

1. The rules and regulations for the indications division (Instructions No. 22, series of 1885) are amended to read as follows, to take effect August 1:

2. Before taking charge of the indications division the officer assigned will report to the Chief Signal Officer for instructions. (Ins. 13, 1884.)

3. The indications officer will have charge of the division for the preparation of synopsis and indications, which will be designated as the indications division. He will carefully scrutinize the charts and latest reports and call the especial attention of the indications board to all meteorological conditions requiring their action under the regulations, and will at all times keep himself informed of all regulations and orders referring to the work of the division.

4. The duties of the indications officer will not be assumed by another officer or assistant except in an emergency; in which case he will report the fact to the Chief Signal officer at the next office hour, and the officer or assistant whose duties have been assumed will, at his earliest opportunity, make a detailed report, in writing, of the cause of his absence, and in case of illness the statement will be accompanied by a medical certificate, as prescribed in paragraph 2, page 45, of the General Regulations. (Ins. 2, 1886.)

5. He will report for duty in the indications division at 9 a. m., 12 m., 5 p. m., and 11 p. m. each day.

6. He will examine the reports carefully to discover telegraphic errors; note all such errors and call upon the telegraph division for corrections when they are necessary and can be obtained. When errors or doubtful reports are discovered during the preparation of the charts the translator will at once call for a repetition of the report when practicable.

7. The indications officer will call for special telegraphic observations to be taken at such stations and at such times as he may consider necessary. (Ins. 74, 1884.)

8. He is strictly required to draw his own isobars, isotherms, and storm-tracks upon the weather chart (No. 1) used in preparing the synopsis and indications.

9. He will verify and correct the copy or proof of the synopsis, indications, and special bulletins, seeing that the text is clear and legible, and will attach his signature to the file copies kept in the indications division. He will also see, as far as may be in his power, that the indications and special bulletins are given the widest publication where they may be useful.

10. The indications officer, during his tour of duty, has charge of, and is responsible for, not only the promptness and correctness of the indications, but for the timely delivery of the copies of the same to their several destinations in this city, and for the prompt and correct printing and delivery of all maps, charts, and bulletins at this office growing out of, and connected with, his duties, and, so far as is necessary to their proper performance in the same sense that an officer of the day at a military post has authority, he is authorized and directed to assume such control as will enable him to perform all these duties correctly, and for which he will be held strictly accountable. (Mem. 32, 1886.)

11. A single copy of the synopsis will be sent to the publications division by 9.30 a. m., the complete synopsis and indications not later than 9.50 a. m., and the special bulletin, when issued in the morning, by 9.55 a. m., and the indications for the midnight report will be completed and ready for the messenger by 12.45 a. m.

12. For the morning weather chart the indications officer will make tracings of the isobars, isotherms, and storm-tracks, from the original charts of the 7 a. m. report, as soon as practicable, preferably before the completion of the indications. These tracings will be sent to the lithographing room by or before 9.30 a. m. daily. He will give close attention to the morning weather chart until it has been actually completed, seeing that all through its several stages the work is correctly done, and leaving no chance

for errors. For this purpose he will visit the printing room and inspect the chart when it is first struck off and verify it before allowing the edition to be printed. (Ins. 140, 1884.)

13. He will compare each tri-daily indications of the previous day with the conditions exhibited on the succeeding charts covering the time for which the indications are made.

14. He will particularly notice, in connection with the study of charts, the rain and dry-wind charts, the charts and tables of normal temperatures and normal barometric pressures and the barometric oscillations for the several stations, the charts exhibiting average direction of translation of low barometers (storm-tracks), the Monthly Weather Review and its charts, and the file of tri-daily charts and prevailing wind-directions. These charts should be examined in reference to the corresponding month of preceding years, and to the months preceding and succeeding the current month. Particular attention should be given to the study of the cloud-areas and the depression of the dew-point as affecting probable changes of temperature and rainfall and the occurrence of frosts.

15. He will see that the mounted messenger is present, with horse saddled, at the moment the indications are ready, and that he starts immediately at a rapid pace; any failure in this particular will be reported in writing. (G. O. 28, 1873; Ins. 29, 1876.)

16. A messenger will report to him each morning at 8 o'clock in the indications division, and continue under his orders until after the completion of the morning duties. (Ins. 192, 1881.)

17. Messengers will not be intrusted with the delivery of the indications until they have performed this duty in company with a messenger familiar with the routine of this work.

18. The indications officer should sleep during a portion of the afternoon, or between the afternoon and midnight reports, as the fatigue caused by this duty is too great to permit its best discharge with only the rest which can be obtained between the midnight and morning reports.

19. Officers on duty in the indications division are excused, during the time of their tour, from the continuous night-watch, as noted in paragraph 3, page 80, General Regulations, 1885, but may be required to remain at the office to announce the progress of storms or other facts connected with their especial duty when necessary. (Ins. 14, 1878.)

REPORTS.

20. Form 434 (check-slip for indications officer) will be carefully examined by the indications officer at each report, and as each item of the report is completed it will be successively checked. The check-slips will be sent with the record-book of the indications board to the Chief Signal Officer before 12 m., daily, except Sunday. (Ins. 69, 1884.)

21. A tri-daily report of the time of completion and delivery of the daily publications of the indications division will be made in the form given below. The indications officer will lay these three reports on the Chief Signal Officer's table not later than 12 noon daily.

[Form No. 425 g—1885.]

Indications officer's tri-daily report.

Date.................................. Hour.................................. Messenger's name..................................

Indications.	Special bulletin.	Weather and temperature.	Time delivered to messenger.	To whom delivered.		Time of delivery to be entered by receiver.	Signature of receiver.
			..	New York Associated Press........	Tri-daily list—always first.	....	....
			..	United Press Association........		....	....
			..	Western Union Telegraph Company........		....	....
			..	Bankers' and Merchants' Telegraph Co........		....	....
			..	Baltimore and Potomac Depot........		....	....
			..	Secretary of War........	Daily list.	....	....
			..	Critic........		....	....
			..	Star........		....	....
			..	Post........		....	....
			..	Republican........		....	....
			..	The Item, Alexandria, Va........		....	....
			..	Post-office........		....	....
			..	Journal........	Weekly list, for Sunday.	....	....
			..	Herald........		....	....
			..	Capital........		....	....
			..	Chronicle........		....	....
			..	Republic........		....	....
			..	Gazette........		....	....

Material for morning map delivered to printer at —— a. m.
Map completed and in hands of messenger at —— a. m.
Messenger left at —— m.
I certify that the foregoing is a true return for the report and date named.

—— ——, *Indications officer.*

NOTE.—The midnight indications will be prepared and delivered to the Associated Press Companies not later than 1.15 a. m. The indications officer will personally fill up in his own hand the time delivered to messenger and the time messenger left; and he will lay these reports on the table of the Chief Signal Officer not later than 12 m.

22. Action upon telegrams requesting special weather indications will be taken at once by the officer in charge of the indications division, or, in case of his absence, by a member of the indications board. (Ins. 111, 1884.)

PRESS REPORT.

23. Indications will be prepared at each report for all States east of the Rocky Mountains, except Colorado and the eastern portion of Dakota Territory, for which indications will be prepared at midnight only. The prediction for Texas will apply to that portion of the State east of the one hundredth meridian. When the indications are completed for any State its name will be crossed off the check-slip containing the names of States.

24. The list of addresses for the distribution of the press reports and special bulletins will be posted in the indications division and kept corrected to date. (L. R. 6679, Mis. 1884.)

25. A slip similar to the form given below will accompany the morning synopsis, tracings, indications, and special bulletin sent to the publications division.

PRINTER'S SLIP.

———————, 188—

Synopsis sent to printer	a. m.
Synopsis received by printer	a. m.
Map sent to printer	a. m.
Map received by printer	a. m.
Indications sent to printer	a. m.
Indications received by printer	a. m.
Special sent to printer	a. m.
Special received by printer	a. m.

26. When signals are displayed the printer's signal check (Form No. 430*c*), bearing check-mark opposite stations at which signals are displayed, will accompany the morning indications sent to the publications division.

CHARTS.

27. The following designation is adopted for indications division charts, and will be written in blue pencil on the right-hand lower corner of each leaf, in each monthly book of tri-daily charts, together with the name of the officer in charge of indications, and the date and number of the tri-daily chart. The 7 a. m., 3 p. m., and 10 p. m. charts being numbered "i," "ii," and "iii," respectively:

Chart 1. Weather.
Chart 2. Barometric changes.
Chart 3. Temperature changes.
Chart 4. Clouds.
Chart 5. Dew-points and local storms.

28. In the preparation of these charts, pencils of different colors, as prescribed, will be used. When not otherwise stated, the ordinary black lead-pencil is intended. If possible, all lines traced on these charts will be extended across the continent.

29. Charts 1 to 5, inclusive, for August 15, 1886, will be followed as models. No change will be made in the form of any of these charts without the written authority of the Chief Signal Officer. (Ins. 53, 1881.)

30. Each officer in turning over the charge of the indications division to his successor will see that the charts are completed to the date of relief. (Ins. 40, 1877.)

31. All telegraphic reports received by mail on account of being delayed at stations or at transfer offices, from any cause, will, as soon as they arrive, be translated and entered on the indications charts. (Ins. 16, 1884.)

32. On all charts, data received too late for use in current indications will be entered in blue; in such instances, the amount of precipitation, if any, will be underscored in red.

33. Chart corrections to reports will be given in blue by the side of the corresponding erroneous data, through which a blue line will be traced.

CHART 1.

34. Chart 1 will show for each station: (1) temperature; (2) barometer (reduced to sea-level; (3) wind-velocity, and, when reported, the maximum velocity since last regular report; (4) the amount of rainfall (or melted snow); (5) the state of weather; (6) wind-direction; (7) ocean swell at certain sea-coast stations.

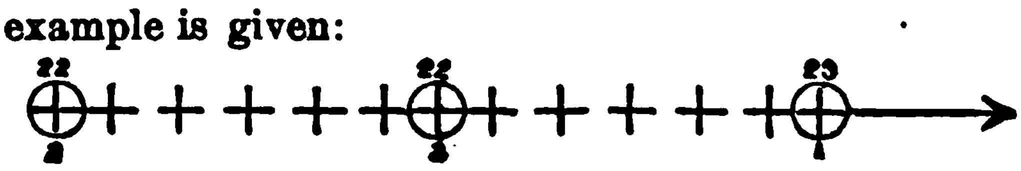
35. Isotherms, with their proper figures, will be drawn in blue for each ten degrees of temperature, in full lines; when doubtful, in broken lines.

36. Isobars, with their figures, will be drawn in red for each tenth of an inch of barometric pressure, in full lines; when doubtful, in broken lines. The words "high" or "low" will be so placed as to show the relative barometric condition of the regions marked.

37. Except in cases of unusual gradient, isotherms and isobars will not be drawn to inclose an area embracing fewer than two stations.

38. Storm-tracks; the position of the storm-center at the hours of observation will be indicated by a small circle inclosing a plus sign. The movement of the storm-center in eight hours will be indicated by a line of plus signs connecting the circles locating the positions of the storm-centers. These storm-tracks will be traced for the morning weather map when the location of the storm-centers can be given for three or more reports. Figures above the circles for storm-centers will indicate the dates, and figures below the circles for storm-centers will indicate the hour of observation. An arrow-head in front of the circle for the last storm-center will point in the probable direction of the storm movement.

The following example is given:



39. The wind-velocity will be entered as received, in miles per hour if registered; if estimated, by writing "calm," "light," "high," &c., as the case may be. Maximum wind-velocities, when reported, will be entered in parenthesis to the right of the current velocity.

40. The amount of precipitation for the eight hours preceding the report, if any, will be entered in inches, tenths, and hundredths, underscored in blue; if inappreciable, a short horizontal line will be drawn, underscored by a similar line in blue. The absence of precipitation will be shown by the figures 00.

41. The direction of the wind will be shown by an arrow, flying with the wind, drawn through the center of the station circle.

42. The state of the weather at the time of the report will be shown thus: Cloudy by circle fully shaded; fair by circle one-half shaded; heavy rain by "R."; light rain by "r."; heavy snow by "S."; light snow by "s."; threatening by "T."; clearing by "C."; foggy by "f."; hazy by "z."; smoky by "sm."; sleeting by "slt."; written within the circle. A thunder-storm will be indicated by a short horizontal line in red, within and at the bottom of the circle. Frost will be written in full near the circle and will be underscored in red, prefixed by "K" or "L" to denote killing or light, respectively.

43. The ocean swell, from sea-coast stations, will show the direction from which it comes and its character as heavy or light, thus: Heavy northeast swell, by writing by the side of the station, "Hy. NE.," or light south, thus: "Lt. S."

44. All reports received, other than the tri-daily telegraphic reports, will be entered on the margin of the chart, with the hour of observation noted.

45. The absence of data for temperature, barometer, wind-velocity, weather, and sea-swell, will be shown by a short horizontal line in the space specified for the data itself.

46. The absence of data for precipitation will be shown by writing in its place "blk." Such absences will also be noted on the margin of the chart.

47. Data of doubtful accuracy will be questioned thus "?," and by a note on the margin of the chart; marginal notes will always be in blue.

48. When a station is reported as missing the fact will be indicated by drawing a short line within the circle.

CHART 2.

49. Chart 2, barometric changes, requires the following definitions of the terms used:

An actual barometer is the barometer reading corrected for temperature and instrumental error only.

A reduced barometer is the barometer reading corrected for temperature and instrumental error, and gravity, and reduced to sea-level.

Abnormal changes in barometer (on Chart 2) are changes for eight hours, with the diurnal change for that period eliminated.

Auxiliary Charts.

50. In connection with Chart 2 three auxiliary charts are used to show for each station, by figures in blue near the circle, the mean of the barometer readings (the normal) for each tri-daily report of the current month. These means (except for Canadian stations for actual barometer) are for the reduced barometer. Within the circle will be shown by figures in blue the difference between the mean barometer for the current and that of the preceding observation. This difference will be preceded by the sign + when the mean for the preceding observation is greater than the mean for the current observation, and by the sign — when it is less.

51. The frequency of the wind-direction for the month (including calms), at the several stations, will be shown on the a. m. auxiliary chart by arrows flying with the wind, not more than three directions being given. The order of relative frequency will be shown by blue, red, and yellow arrows, respectively. The prevalence of calms will be indicated by drawing a circumference around the circle of station of the proper color, to show the order of relative frequency; also on these auxiliary charts, isobars will be drawn in red to show each tenth of inch of mean reduced pressure, as determined for each of the tri-daily reports of the month. At the end of the month, these charts will be pasted in the bottom of the book of charts (Chart 2).

52. The officer of the stations division will furnish, for each month, for the use of the indications officer, a table of the 7 a. m., 3 p. m., and 10 p. m. mean readings of the reduced barometer (the normal), except for Canadian stations for which means of the actual barometer will be given.

Preparation of Chart 2.

53. On Chart 2, enter within the circle the reduced barometer from regular stations throughout the United States and the actual barometer from Canadian stations for the current report.

The difference between the current and preceding barometers, after being increased or diminished by the figure in blue within the circle on the auxiliary chart, according to its + or — sign, will be entered above the current barometer and within the circle, preceded by the appropriate + or — sign. This result will represent the amount of abnormal change in the barometer since the preceding report. Enter the difference between the current barometer and that of the previous twenty-four hours, with proper sign prefixed, within the circle and below the current barometer.

54. Lines in blue will show each tenth of an inch of abnormal change in barometer during the past eight hours, with the amount of change in figures, with the sign + to show a rise, and the sign — to show a fall; and a line in blue, of double weight, will be drawn through the points of no abnormal change for eight hours, with the signs + and —, each on its appropriate side.

55. In a similar way lines in red will be drawn to show each tenth of an inch of change in pressure in twenty-four hours, with corresponding signs and figures, and a line in red, of double weight, will be drawn through points on the chart where the pressure is the same as reported twenty-four hours previous, with the signs + and —, each on the appropriate side of this line.

56. Two sets of corrections will be prepared, to be applied to the barometer reports of the first day of each month; these corrections, with proper algebraic signs prefixed, will be written without the circle, one set to be applied, instead of the differences on the auxiliary chart, to the 7 a. m. report, so as to exhibit the true abnormal changes, and the other set to the three reports, so as to exhibit the actual twenty-four-hour changes.

CHART 3.

57. Chart 3, temperature changes, requires the following definitions:

Actual temperature is the temperature observed, corrected for instrumental error only.

A normal temperature is the mean of actual temperatures.

A temperature departure is the difference between the normal temperature and the actual temperature for a given report.

Abnormal changes in temperature (on Chart 3) are changes for eight hours with the diurnal change for that period eliminated.

Auxiliary charts.

58. In connection with Chart 3, three auxiliary charts are used to show for each station, by figures in blue near the circle, the mean of the temperature readings (the normal) for each tri-daily report of the current month. Within the circle will be shown, by figures in blue, the difference between the mean temperature for the current and that of the preceding observation. This difference will be preceded by the sign + when the mean for the preceding observation is greater than the mean for the current observation, and by the sign — when it is less. Isotherms will be drawn in blue to show each ten degrees of normal temperature. At the end of the month these charts will be pasted in the bottom of the book of charts (Chart 3).

59. The officer in charge of the stations division will furnish each month for the use of the indications officer, a table of the 7 a. m., 3 p. m., and 10 p. m. means of the actual temperature readings (the normal) for each station.

Preparation of Chart 3.

60. On Chart 3 enter within the circle the actual temperature of the current report. The difference between the current and preceding temperatures, after being increased or diminished by the figure in blue within the circle on the auxiliary chart, according to its + or — sign, will be entered above the current temperature and within the circle, preceded by the appropriate + or — sign. This result will represent the amount of abnormal change in the temperature since the preceding report. The difference between the current temperature and that of the report twenty-four hours previous will be entered, with the proper sign prefixed, within the circle and below the actual temperature.

61. Lines in blue will be drawn to show each five degrees of abnormal change of temperature during the past eight hours, with figures, and the sign + to show an abnormal rise, or the sign — to show an abnormal fall, in temperature; and a line in blue, of double weight, will be drawn through points of no abnormal change for eight hours, with the signs + and —, each on its appropriate side.

62. Lines in red will be drawn to show each ten degrees of change in temperature during the past twenty-four hours, with figures and signs corresponding; and a line in red, of double weight, will be drawn through points on the chart where the temperature is the same as reported twenty-four hours previous, with the signs + and —, each on the appropriate side of this line.

63. A set of corrections will be prepared to be applied, instead of the differences on the auxiliary chart, to the temperature changes for the 7 a. m. report on the first day of each month so as to exhibit the true abnormal changes in temperature.

CHART 4.

64. On Chart 4 show by the Signal Service cloud symbols the cloud conditions prevailing over the country. For the *upper* clouds, red, placed *above* the circle; for the *lower* clouds, blue, placed *below* the circle.

65. The area of complete cloudiness, when for more than one station, will be inclosed by a green line and marked $\frac{4}{4}$.

66. The direction of movement of the clouds will be shown by an arrow of the color used for the clouds.

67. The stations at which precipitation has fallen since the previous report, and is not falling at the time of report, will be marked within, or near, the circle by a blue cross, thus ×. The cross will be omitted from stations from which clouds are not required to be sent.

68. Dense haze or smoke will be shown, respectively, by writing within or near the circle "Z" or "SM," and light haze or smoke by "z" or "sm," in red or blue, as the conditions belong to upper or lower clouds.

69. Dense fog will be shown by writing, in blue, "F," within or near the circle, and light fog by "f."

70. On the 7 a. m. chart will be entered, within the circle, the minimum temperature for stations east of the Rocky Mountains, except Key West, Fla., and from June 1 to August 31, inclusive, the stations on, and south of, the parallel of Lynchburg, Va.

71. Isotherms in blue will be drawn for each ten degrees of minimum temperature, as explained in Chart 1.

72. Temperatures will be compared with temperatures of the same stations for the preceding day, and the difference, prefixed by the signs + or —, to show respectively a rise or fall, will be placed immediately without the circle, and, if practicable, to the right.

73. A line of double weight, in *red*, will be traced between the + and — differences to indicate no change in minimum temperature in one day, with the signs + and —, each on its appropriate side.

74. From May 1 to September 30, on the 3 p. m. chart, will be entered, within the circle, the maximum temperature. Isotherms in blue will show each ten degrees of maximum temperature. These temperatures will be compared with those of the same stations for the preceding day, and the difference, and sign, will be placed as required in the case of minimum temperatures.

75. A line of double weight, with proper signs in red, will show no change in maximum temperatures in twenty-four hours.

76. On the 11 p. m. chart, the character of the sunset will be shown by Signal Service symbols, *i. e.*, by a vertical tangent, equal in length to the diameter of the circle, and drawn on the west side, in different colors, as follows, viz: Fair, by red; cloudy, by blue; green, by green; yellow, by yellow.

77. When auroras or halos are reported from stations they will be shown on this chart by a circle drawn within the station circle, auroras in red, halos in blue.

CHART 5.

78. Chart 5 will show for all stations (except those stations not required to send the dew-point) the weather, wind-direction, temperature, depression of the dew-point below the temperature of the air, velocity of wind at the time of observation, and the amount of precipitation.

79. The data will be entered as on Chart 1, except that the depression of the dew-point will replace the barometer. A horizontal line will be placed between the temperature and the depression of the dew-point—thus, $\frac{54}{8}$.

80. Isotherms in blue, with proper figures, will be drawn for each five degrees of temperature. The isotherm of 40° will be made of double weight where it passes over a region in which the depression of the dew-point is 8° or less. Lines in red, with proper figures, will show each five degrees of equal depression of the dew-point.

81. Carbon lines, of double weight, will separate the regions of northerly and southerly winds. The letters "N" and "S" to indicate northerly and southerly winds, respectively, will be placed on the appropriate sides of these lines.

82. Each clerk will write his initials in the lower right-hand corner of the chart prepared by him, and he will be held responsible for the correctness and completion of such chart. Before leaving the chart he will carefully examine all figures and signs, and will correct any defects in spacing, shape, and legibility. In case of delay in the receipt

of data, he will complete the lines at the first opportunity after the receipt of such data. The clerk entering late data will, at the same time, enter the eight and twenty-four hour changes. (L. R. 6679, Mis., 1884.)

DUTIES OF CLERKS.

83. The clerical force of this division will be divided into three reliefs: The first relief from 8 a. m. until 11.30 a. m.; the second relief from 3.30 p. m. until relieved by the officer in charge; the third relief from 10.30 p. m. until relieved by the officer in charge.

84. In the absence of a commissioned officer, the senior non-commissioned officer present will be responsible for the discipline in the indications division.

85. The clerical duties of this division will be equally distributed, and clerks charged with the performance of regular or special duties will be assisted by clerks who have completed the duties assigned to them.

86. The clerks will be designated as 1, 2, 3, 4, 5, and 6, with division of duty, in regular detail, as follows:

	A. M.	P. M.	Midnight.
Clerk 1	Charts 4 and 5	Chart 1	
Clerk 2		Charts 4 and 5	Chart 1.
Clerk 3	Chart 1		Charts 4 and 5.
Clerk 4	Chart 2	Chart 2	
Clerk 5		Chart 3	Chart 3.
Clerk 6	Chart 3		Chart 2.

87. On the 15th day of each month, at the 3 p. m. report, each clerk will assume the duties of the next succeeding number as indicated above, except that 6 will be assigned to the duties of 1.

MORNING CLERICAL DUTIES.

88. The clerk preparing Chart 1 will change the calendar; prepare for use the printer's manifold map, check-slip for indications officer, tri-daily report of indications officer, printer's slip, signal-check slip, and the telegraph blanks for morning weather and temperature predictions; set up and print synopses and indications; distribute type; file a copy of the 7 a. m. indications and note on it the time of issue; note on monthly record the time of completion of 7 a. m. synopsis, printer's manifold map, indications and special bulletin, and the 10 p. m. indications; write the special telegrams and signal orders, adjust signal board as the names of stations are read from the signal orders by the indications officer; enter signal orders in record books; before leaving see that signals are properly carried forward in the signal record books, and that they agree with the display on the signal boards; enter maximum velocity and wind-direction in cautionary-signal record book; file cold-wave orders for Washington City with the observer; note that all of the tri-daily reports of the indications officer are returned by messenger, properly timed and signed, and ready for the table of the Chief Signal Officer; return papers for file in correspondence division after they are properly checked by the indications officer; see that all messengers detailed are thoroughly capable and familiar with their duties; also on Sunday send special to Professor Carpmael; place new blank in cautionary-signal record book; wind clock. Miscellaneous: keep a list, revised to date, showing the distribution of the 7 a. m. synopses, indications, and special bulletins; make requisitions for, and keep on hand, sufficient forms, stationery, printer's material, &c., for a month in advance; keep desk supplied with message blanks corrected to date; keep records of stationery expended, charts loaned, changes in detail, and absences; prepare monthly roster, and tables for reference for desk of indications officer.

Other morning duties will be performed as follows:

Writing special bulletin and noting time of issue on file copy by clerk preparing Charts 4 and 5.

Writing copy of the special bulletin on blackboard, weekly in rotation, in the following order: by clerks preparing Charts 3, 2, 4 and 5. The clerk performing this duty will, after completion, file in the indications division the special bulletin used.

Acting as clerk for indications board, except Sundays and holidays, daily, in rotation, in the following order, by clerks preparing Charts 3, 1, 2, 4 and 5.

Assisting, when necessary, in writing special telegrams and signal orders; entering in signal-record books, &c., by clerks preparing Charts 2, 3, 4 and 5.

Reading proof; correcting all forms to date, including telegraph blanks for weather and temperature predictions; preparation of auxiliary charts; noting on temperature and barometer charts the correction to be applied on 1st day of month, by clerks preparing Charts 2, 3, 4 and 5.

Filing and indexing orders, instructions, and memoranda, by clerk preparing Chart 2.

Preparing charts showing mean monthly temperature and precipitation and mean quarterly temperature and precipitation for use in preparation of special monthly and quarterly bulletins, by clerks preparing Charts 2, 3, 4 and 5; entering data, reported on 1st day of month, on the above normal precipitation chart, by clerk preparing Chart 1; completion of this chart by clerk preparing Chart 2; entering data, reported on 1st day of month, on the above normal temperature chart, and completion of the same by clerk preparing Chart 3.

AFTERNOON CLERICAL DUTIES.

89. The clerk preparing Chart 1 will prepare for use the tri-daily report of indications officer and the telegraph blanks for afternoon weather and temperature predictions; enter river reports and changes, in feet and tenths, on Form No. 130, and give river changes for publication in feet and inches; set up and print indications; distribute type; file a copy of the 3 p. m. indications and note on it the time of issue; write the special telegrams and signal orders; adjust signal board as the names of stations are read from the signal order by the indications officer; enter signal orders in signal-record books; before leaving see that signals are properly carried forward in the signal-record books, and that they agree with the display on the signal boards; file cold-wave orders for Washington City with the observer; note that messenger has returned the tri-daily report of indications officer for the previous midnight; see that all messengers detailed are thoroughly capable and familiar with their duties; keep a list, revised to date, showing the distribution of the 3 p. m. indications; file Form No. 130 in the record book when completed.

The clerks preparing Charts 2, 3, 4 and 5 will, when necessary, assist in writing special telegrams and signal orders; entering signals in signal-record books, &c.

The clerk preparing Chart 2 will keep a list, revised to date, showing the regions for which weather and temperature predictions are sent, and to what addresses, with the authority for each address stated.

The clerk preparing Chart 3 will daily prepare, for use at midnight, a set of telegraph blanks for weather and temperature predictions, dated, signed, and compared with the above list. He will also place with this set the blanks for the Canadian and general "good night."

MIDNIGHT CLERICAL DUTIES.

90. The clerk preparing Chart 1 will prepare for use the tri-daily report of indications officer, and note that the messenger has returned the one for the previous report; notify the observer to send for the nearest assistant when the indications officer is not present at 11.30 p. m.; set up and print indications; distribute type; file a copy of the midnight indications and note on it the time of issue; when other duties will permit, write the special telegrams and signal orders; adjust signal board as the names of stations are read from the signal orders by the indications officer; enter signal orders in the signal-record books. Before leaving see that the "good nights" have been entered; that signals are properly carried forward in the signal-record books, and that they agree with the display on the signal boards; see that all messengers detailed are thoroughly capable and familiar with their duties.

The clerks preparing Charts 2, 3, 4 and 5 will write the weather and temperature telegrams, and, when necessary, assist in entering data on Chart 1, writing and entering signal orders, &c.

The clerk preparing Chart 3 will file cold-wave orders for Washington City, and the Simpson message with the observer on duty in the stations division.

PREPARATION OF SYNOPSIS, INDICATIONS, SPECIAL BULLETIN, ETC.

The Synopsis.

91. The following statements, briefly made, are essential to the "synopsis":

The regions of the highest and lowest barometer, and, if within the limits of the chart, the location and path of the storm-center; in special cases, the direction of movement of areas of high barometer; for the several States, the weather, the temperature, and the wind direction; special temperatures whenever 15°, or more, above or below the normal; heavy rainfalls in past twenty-four hours at selected stations; and all changes in the rivers, equal to or exceeding one foot, will be noted and briefly stated, thus: "The rivers have risen (or fallen) at" [here give the names of stations and amount of change]; or "de-

cidedly risen (or fallen) at ———"; or give the number of feet, where the change is remarkable. When the river is near or above the danger line or very low at any place, all changes will be noted. When the probable changes may be of great importance, they will also be mentioned in the special bulletin. (G. O. 28, 1873; Ins. 3, 1881; Ins. 69, 1884.)

92. Special temperatures will be given as follows: 7 a. m. temperatures from June 1 to September 30, from Eastport, Montreal, Quebec, Mount Washington, Cleveland, Alpena, Duluth, Saint Paul, Denver, San Francisco, and San Diego; and from November 1 to April 30, the 3 p. m. temperatures from Washington City, Norfolk, Savannah, Atlanta, Jacksonville, Pensacola, New Orleans, Galveston, Los Angeles, and San Diego.

93. The synopsis will be prepared at the 7 a. m. report only, and will apply to the preceding twenty-four hours. (Mem. 109, 1886.)

The Indications.

94. The indications will be prepared by naming the States or parts of States for which each indication is made.

95. The following statements, briefly made, are essential to the "indications":

Anticipated frosts and freezing weather as far in advance as possible; changes anticipated in the rise and fall of rivers; and, at the close, the stations, or, when the display is general, the names of lakes and sections of the sea-coast where signals are displayed. (G. O. 28, 1873; Ins. 13, 1877; Ins. 46, 1881; Ins. 69 and 131, 1884.)

96. When it is possible to make the same prediction of weather, winds, and temperature apply to several States, such States may be grouped together, but States not contiguous to each other will not be included in a single group.

97. Predictions will be made for the following States, which will be named in indications in the order given below, except that the District of Columbia will be placed first on the line in which it occurs (mem. 156, 1886); the expected conditions of weather, winds, temperature, and, in cases of decided change, barometer, for the twenty-four hours following the next telegraphic report:

States.	Prediction.
Maine	
New Hampshire	
Vermont	
Massachusetts	
Rhode Island	
Connecticut	
Eastern New York	
Eastern Pennsylvania	
New Jersey	
Delaware	
District of Columbia	
Maryland	
Virginia	
North Carolina	
South Carolina	
Georgia	
Eastern Florida	
Western Florida	
Alabama	
Mississippi	
Louisiana	
Texas*	
Arkansas	
Tennessee	
Kentucky	
West Virginia	
Western Pennsylvania	
Western New York	
Ohio	
Indiana	
Illinois	
Eastern Michigan	
Western Michigan	
Wisconsin	
Minnesota	
Eastern Dakota †	
Iowa	
Missouri	
Nebraska	
Kansas	
Colorado †	

*To apply to that portion of the State east of the 100th meridian. †At midnight only.

Special predictions.

98. At the close of the indications prepared from the 10 p. m. reports, such indications of weather, storm movements, and river changes will be added as it may be possible to make for the succeeding forty-eight hours.

99. In making special predictions the officer in charge of the indications division may either use the names of geographical divisions or name the States.

100. New forms of expression are forbidden until approved by the Chief Signal Officer.

101. The use of the following words is prohibited in all predictions: Or, mostly, probably, possibly, pressure, partly cloudy, occasionally cloudy, occasional cloudiness, warm-wave, easterly to southerly winds, and similar expressions for wind direction.

102. When practicable, use the word "veering" when the wind changes direction with the hands of a watch, and "backing" when it changes in the contrary direction.

Example of Synopsis.

WASHINGTON CITY, *Thursday, November* 17, 18—, 7 a. m.

SYNOPSIS FOR THE PAST TWENTY-FOUR HOURS.

103. The storm which was central yesterday morning north of Lake Superior has moved eastward and is now central in the lower Saint Lawrence Valley. The barometer is lowest north of Maine and highest in Montana. Rain has prevailed in the lake regions and the Ohio Valley, and light snows in the Missouri and Upper Mississippi Valleys. Generally fair weather continues in the Southern States and on the Atlantic coast. The temperature has risen in the Southern, Middle, and New England States, the Ohio Valley, and lower lake region; it has fallen decidedly in the upper lake region, and thence westward to the Rocky Mountains, and a "cold wave" is moving eastward from Dakota and Montana, where the temperature is about 10° below zero. Fresh and brisk southerly winds continue on the Atlantic coast. Severe southwest to northwest gales have prevailed in the lake regions, and the winds have shifted to northerly in Minnesota and Dakota, and thence southward to Texas, causing the temperature to fall from 20° to 40° in the States north of Texas.

The following special temperatures were reported at 3 p. m. yesterday: Washington City, 45°; Norfolk, 44°; Savannah, 60°; Atlanta, 54°; Jacksonville, 71°; Pensacola, 64°; New Orleans, 73°; Galveston, 63°; Los Angeles, 65°; San Diego, 67°.

The Ohio River has risen 6 feet at Cincinnati and 5 feet at Louisville. The Mississippi has risen 4.6 feet at Saint Louis, 2 feet at Cairo, and fallen slightly at Memphis and Vicksburg. The Cumberland has fallen 2.3 feet at Nashville, where it is now 3 feet below the danger-line.

Example of Indications.

WASHINGTON CITY, *Thursday November* 17, 18—, 10 p. m.

INDICATIONS FOR TWENTY-FOUR HOURS COMMENCING AT 7 A. M. ON FRIDAY, NOVEMBER 18.

104. For *Maine, New Hampshire*, and *Vermont:* Light rains; southwest, shifting to westerly, winds; lower temperature; rising barometer.

For *Massachusetts, Rhode Island*, and *Connecticut:* Fair weather, followed by rain; brisk southerly winds, shifting to westerly; decidedly colder.

For *Eastern New York, Eastern Pennsylvania, New Jersey*, and *Delaware:* Cloudy weather and rain; warmer southerly, shifting to much colder westerly, winds, with a cold wave during Saturday.

For the *District of Columbia, Maryland*, and *Virginia:* Light rains; winds shifting to westerly; warmer, followed by colder, weather; lower barometer.

For *North Carolina, South Carolina, Georgia*, and *Eastern Florida:* Fair, slightly warmer weather; light winds, becoming southerly.

For *Western Florida* and *Alabama:* Warmer, fair weather; light variable winds.

For *Mississippi, Louisiana*, and *Texas:* Cloudy weather and rain, changing to snow in northern portions; much colder northerly winds, and a severe "norther" during Saturday; higher barometer.

For *Arkansas, Tennessee*, and *Kentucky:* Rain and snow; winds shifting to colder northwesterly, with a cold wave; higher barometer.

For *West Virginia, Western Pennsylvania*, and *Western New York:* Rain and snow; colder northwest to southwest winds, increasing in force, with a cold wave on Saturday; higher barometer.

For *Ohio*, *Indiana*, and *Illinois:* Rain and snow; colder and freezing weather; brisk and high northwest winds; higher barometer.

For *Eastern Michigan*, *Western Michigan*, and *Wisconsin:* Light snows; colder northwest winds, dangerous on Lakes Michigan and Huron.

For *Minnesota*, *Eastern Dakota*, *Iowa*, and *Missouri:* Light snows, followed by fair weather; colder northwest winds.

For *Nebraska:* Light snows, followed by colder fair weather; northerly winds, becoming light and variable.

For *Kansas:* Light snows, followed by colder, fair weather; northerly winds; higher barometer.

For *Colorado:* Fair weather; stationary temperature; light variable winds.

RIVERS.—The Upper Ohio River will fall slowly, and the Lower Ohio will rise at points between Louisville and Cairo. The Lower Mississippi will remain about stationary. The Cumberland and Tennessee will continue to fall.

SIGNALS.—Cautionary northwest signals continue at stations on Lakes Michigan, Erie, and Huron, and are ordered for Indianola and Galveston. Cautionary on-shore signals continue at stations on Lake Ontario, and cautionary southwest signals continue on the Atlantic coast from Hatteras to Boston.

SPECIAL PREDICTIONS FOR SATURDAY.—Frosts and freezing weather are indicated for the States in the Missouri Valley and thence southward to Northern Texas. Colder, fair weather is indicated for Virginia and North Carolina.

The Special Bulletin.

105. Immediately after the completion of the synopsis and indications from the a. m. reports, a "Special Bulletin" will be prepared whenever the conditions indicate changes in any section which should receive special mention. In the bulletin no reference will be made to barometric conditions, and all technical terms will be avoided. It will begin with the most important feature as determined from the reports of the last twenty-four hours; will announce the approach of unusually warm weather and cold waves; of frosts; the river conditions when dangerous floods exist, or are anticipated; the movements of well-defined storms, giving the direction and naming the States where they will be most severe; the amount of unusual changes in temperature in general terms, and the current temperature at the several stations where the change has been greatest; the actual rainfall equal to, or exceeding, 1 inch in twenty-four hours for selected stations; and will contain all data relative to cold-wave signals. Storms and cold waves will be treated as specifically as possible, and their progress carefully traced and announced from day to day. (Ins. 140, 1884.)

106. The bulletin will close with such indications of weather, storm movements, and river changes as it may be possible to make for the succeeding twenty-four or forty-eight hours. The indications referring to the movements of freshet waves in any part of the country east of the Rocky Mountains, when practicable, will be given for several days in advance, and telegraphed to the observers in the threatened districts.

107. When frosts which may prove injurious to crops are likely to occur, the bulletin will contain special warnings of their approach, which the officer in charge will telegraph to the observer at stations in the threatened districts, with directions to give them the widest distribution.

Example of Special Bulletin.

WASHINGTON CITY, *February* 25, 188—, 10 a. m.

108. A severe storm is now central over the upper lake region, moving easterly, which will cause high southerly, shifting to westerly, winds in the States bordering on the Atlantic.

A cold wave is advancing southeastward from Dakota; its influence will be felt in the lake regions, the Ohio Valley, and Tennessee and west Gulf States during to-night, and in the States bordering on the Atlantic during Friday.

The temperature has risen between 10° and 20° in the States bordering on the Atlantic, the East Gulf States, the Ohio Valley and Tennessee, and from 20° to 30° in the lake region; it has fallen from 10° to 40° in the Upper Mississippi and Missouri Valleys, and from 20° to 30° in the western portion of the upper lake region.

The following stations report 1 inch or more of rainfall during the past twenty-four hours: Memphis, 1.44; Grand Haven, 1.29.

Special indications for Friday.—A cold wave is indicated for the middle Atlantic States, the south Atlantic States, the Ohio Valley and Tennessee, and lower lake region. The temperature will fall from 20° to 40°.

109. The 10 a. m. special bulletin will be printed in a manner similar to the model on file in the correspondence and records division, and will be posted in frames at all places where the morning weather chart is displayed. (Ins. 46, 1881; Ins. 80, 1882.)

110. The indications officer will mark in red pencil such parts of the synopsis, indications, and special bulletins as may be of special interest.

111. In transmitting the synopsis, indications, and special bulletins, the officer in charge of the telegraph division will cause to be sent, underlined, the portions marked in red or other color. (Mem., Dec. 29, 1884, File Mis.)

The Monthly Special Bulletins.

112. On the first day of each month the officer in charge of the indications division during the preceding month will prepare a special bulletin, in which will be incorporated general remarks on the mean temperature and total precipitation of that month and the average depth of snow on the ground at the end of the month in the several States, together with brief descriptions of damaging frosts, severe storms, &c., which may have occurred during the same period. The bulletin will close with special directions to those receiving it to give it the widest publication. A copy of the bulletin will be sent direct to the printer before 3 p. m. of the first day of the month, and will be printed in the same manner as the special bulletin. The edition will consist of 300 copies. (Ins. 87 and 108, 1884.)

113. When the month closes a season there will be given, in addition to data for the month, the mean temperature and total precipitation for the season, together with the departures from the normal temperature and precipitation for that season.

114. The officer in charge of the stations division will furnish for the use of the indications officer the tables of mean monthly temperature and precipitation and mean quarterly temperature and precipitation.

Example of the Monthly Special Bulletin.

SPECIAL BULLETIN FOR DECEMBER.

SIGNAL OFFICE, WAR DEPARTMENT,
Washington City, January 1, 1886.

115. The month of December has been generally warmer than the average December temperature in all States, but the departure from the normal temperature varied only from 1° to 3° in the Northern States east of the Mississippi. In the East Gulf and South Atlantic States and in East Tennessee the temperature was slightly below the normal for the month, the greatest departure being along the east Gulf coast and in northern Florida, where it was from 2° to 3° colder than the average December temperature.

In the Northwest and at northern and central Rocky Mountain stations the month has been unusually warm, the average temperature ranging from 6° to 16° above the normal, the greatest departures being reported from Montana and western Dakota. It was slightly warmer in all districts on the Pacific coast and in the West Gulf States, and it was about 3° above the normal in New England and the Middle Atlantic States, while at stations in the interior of Indiana and Ohio it was slightly below the normal. The maximum departures from the normal occurred at the following stations: *Above the normal*, Fort Assinaboine, 16°; Fort Buford, 16°; Fort Custer, 14°.9; Deadwood, 11°.5; Helena, 10°.6; Cheyenne, 6°.1; Denver and Saint Louis, 5°.8. *Below the normal*, Jacksonville, 3°; Pensacola, 5°.4; Mobile and New Orleans, 2°.1. The mean temperature for the month at some of the principal stations was as follows: Boston, 33°; New York City, Philadelphia, and Washington City, 37°; Jacksonville and New Orleans, 53°; Chicago, 31°; Saint Louis, 40°; Denver, 36°; Saint Paul, 21°; San Diego, 56°.

The rainfall for the month has been generally less than the average, except in the central Pacific coast region and at isolated stations in the Lake regions and Northwest, and along the East Gulf and South Atlantic coasts, where an excess of rainfall is reported. The deficiency ranged from 2 to 4 inches in the interior of the East Gulf States and Georgia, and thence northward to the Lake regions and at stations on the West Gulf coast. In New England and the Middle Atlantic States the rainfall was about 1 inch less than the average for the month. The maximum departures from the average rainfall occurred at the following stations: *Below the normal*, Atlanta, 3.4 inches; Vicksburg, 3 inches; Galveston, 2.8 inches. *Above the normal*, Jacksonville, 4.9 inches; Charleston, 2.7 inches; Savannah, 2.1 inches; Escanaba, 2 inches.

The snowfall for the month has been much less than usual, and all stations east of the Rocky Mountains reporting "snow on ground" at the end of the month were north of the forty-second parallel of latitude. Eastport, Oswego, Alpena, Saint Paul, Moorhead,

and Helena report ½ inch of snow on the ground on the last day of the month; La Crosse and Fort Assinaboine, 1 inch; Marquette, Escanaba, Denver, and Salt Lake City, 6 inches.

The most severe storms of the month occurred on the 4th, 5th, and 6th, and from the 26th to the 29th, the former passing over the Lake regions from the northern Rocky Mountain regions and the latter passing along the Atlantic coast, the center at no time being within the limits of the stations of observation; each of these storms was followed by a cold wave which extended over all districts east of the Rocky Mountains. Killing frosts occurred in the lower Rio Grande Valley on the 14th, at New Orleans on the 15th, and freezing weather occurred in northern Florida on the 27th.

WEATHER AND TEMPERATURE SPECIALS.

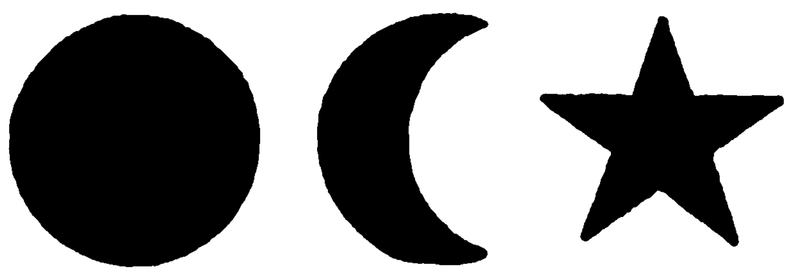
116. The indications officer will send daily, for the regions mentioned, that portion of the indications relating to weather and temperature, including cold waves and frosts, to the addresses on the list furnished to the indications division, which will be corrected monthly.

117. These messages, except those addressed to observers and to the superintendent of the Alabama weather service, Auburn, Ala., will contain, in addition to the prediction, the symbols for the same.

118. The following are the symbols referred to:

WEATHER AND TEMPERATURE SIGNALS.

Sun. Crescent. Star.



Red { Sun—higher temperature.
Crescent—lower.
Star—stationary.

Blue { Sun—general rain or snow.
Crescent—clear or fair weather.
Star—local rain or snow.

119. In case of divided predictions, the signal for weather may consist of two symbols, but the signal for temperature will consist of only the symbol representing the last portion of the prediction.

120. Messages containing the weather and temperature symbols for the midnight prediction, but with the prediction omitted, will be sent to the addresses on the list furnished to the indications division, which will be corrected monthly.

121. The foregoing lists, revised to date, will be kept posted up in the indications division, and will be changed only on memorandum orders received from the officer in charge of the correspondence and records division.

122. The officer in charge will, whenever possible, telegraph probable changes in the weather in the Lake regions and Upper Mississippi and Missouri Valleys to the observer at Baltimore, Md., who will furnish a copy to the secretary of the Baltimore Corn and Flour Exchange. (Ins. 28, 1883.)

STORM WARNINGS (SIGNALS).

123. Cautionary signals will be ordered whenever the indications officer considers it probable that there will occur within 100 miles of the station on any navigable water, a wind-velocity dangerous to navigation, *i. e.*, reaching a velocity of 35 miles an hour. If, at the next regular report following the ordering of signals, it appears that the danger is not so imminent as to justify the display, the signal will be ordered down.

124. The following table of verifying velocities, furnished to stations of the second order, shows the velocity of the wind which should occur at any station to verify a cautionary-signal display; this verifying velocity is based upon a velocity of 35 miles per hour occurring within 100 miles of the station.

Station.	Verifying velocity.	Station.	Verifying velocity.	[illegible]	Verifying velocity.
	Miles.		*Miles.*		*Miles.*
Indianola	35	Cape Henry	35	Erie	29
Galveston	27	Norfolk	30	Cleveland	27
New Orleans	24	Baltimore	19	Sandusky	35
Mobile	27	Chincoteague	34	Toledo	27
Pensacola	26	Atlantic City	22	Detroit	28
Cedar Keys	[illegible]	Sandy Hook	35	Port Huron	28
Key West	[illegible]	New York City	25	Alpena	27
Jacksonville	[illegible]	New Haven	23	Mackinaw City	28
Savannah	[illegible]	New London	22	Grand Haven	33
Charleston	28	Block Island	35	Chicago	32
Wilmington	23	Boston	29	Milwaukee	32
Smithville	30	Portland, Me	28	Escanaba	28
Fort Macon	35	Eastport	28	Marquette	27
Hatteras	28	Oswego	30	Duluth	26
Kitty Hawk	35	Buffalo	33		

(L. S., April 20 and June 17, 1886.)

125. On-shore signals will be ordered whenever the indications officer considers it probable that there will occur at any cautionary-signal station on the lakes, taking observations, winds blowing in an on-shore direction with a velocity between 20 miles per hour and the verifying velocity for cautionary signals. It will not be displayed at the same time with the cautionary signal.

126. The following table shows for each station on the lakes, taking observations, the wind velocities for which an on-shore signal should be displayed:

Station.	Velocities.	Station.	Velocities.
	Miles.		*Miles.*
Oswego	20 to 29	Alpena	20 to 28
Buffalo	20 to 32	Mackinaw City	20 to 27
Erie	20 to 28	Grand Haven	20 to 32
Cleveland	20 to 26	Chicago	20 to 31
Sandusky	20 to 34	Milwaukee	20 to 31
Toledo	20 to 26	Escanaba	20 to 27
Detroit	20 to 27	Marquette	20 to 28
Port Huron	20 to 27	Duluth	20 to 26

127. The following table, furnished to stations on the lakes, taking observations, shows, for each station, the direction from which the wind must blow in order to verify the display of an onshore signal:

Station.	Direction.	Station.	Direction.
[illegible]	NW. to NE.	Alpena	NE. to SE.
[illegible]	SW. to NW.	Mackinaw City	SW. to NW.
[illegible]	NW. to NE.	Grand Haven	SW. to NW.
[illegible]	NW. to NE.	Chicago	NE. to SE.
Sandusky	NW. to NE.	Milwaukee	NE. to SE.
Toledo	N. to E.	Escanaba	E. to S.
Detroit	SE. to SW.	Marquette	NW. to E.
Port Huron	NW. to NE.	Duluth	NE. to SE.

(L. S., April 20 and June 17, 1886.)

128. When practicable, the indications officer will hoist a direction signal with the cautionary signal. The direction signal will be hoisted for winds expected from either of the following quadrants, viz., between north and east, east and south, south and west, and west and north. These quadrants will be known as the northeast, southeast, southwest, and northwest quadrants.

129. Signals will be ordered up in the words "Hoist cautionary and northeast," &c., or "Hoist cautionary," or "Hoist northeast," &c., or "Hoist on-shore," &c. The direction signal will be changed by the words "Change southeast to northwest," &c. Signals will be ordered down in the words "Signals down."

130. On-shore signals will be changed to cautionary in the words "Change on-shore to cautionary and northwest," &c. Cautionary signals will be changed to on-shore signals by the words "Change cautionary to on-shore."

131. The receipt of an order to lower a signal at a cautionary station will not cause it to be lowered until the wind falls below the verifying velocity for that station. The observer will acknowledge the order at once unless the indications officer directs in the order to "acknowledge when the signal is lowered." This will permit the indications officer to order down a signal as soon as he sees indications of the abatement of the storm, and thereby prevent the display of a signal after the storm has passed.

132. To provide further against the display of signals after the storm has prevailed, observers are authorized to wire the fact to this office if the wind falls below the verifying velocity during a display, *provided*, (1) he has no order to lower, (2) that the wind is westerly, (3) that the barometer is rising, (4) and that it is more than one hour before the next tri-daily observation. Upon the receipt of such a telegram the indications officer will decide whether the signal should be lowered at once.

133. The indications officer will assume the undivided responsibility for the display or lowering of all signals. Conditional orders for such display or lowering will not be issued. (Ins. 15, 1886.)

134. Whenever cautionary signals are ordered for a storm and the danger from the storm has passed, and the signals are continued in anticipation of a second dangerous storm, a special explanatory message will be sent to the stations interested. (Ins. 63, 1880.)

135. Sixteen hours on the lakes, and twenty-four hours elsewhere, is a sufficient time to hoist a cautionary or on-shore signal previous to the arrival of the storm. If a signal remains hoisted for more than twenty-four consecutive hours before the arrival of a verifying velocity on the lakes, and thirty-two hours elsewhere, it shall be considered a failure. In verifying, if the non-verified display is continued over the above-mentioned time, it shall be considered a new display. This paragraph will only apply to stations having night telegraph service.

136. On account of there being no night telegraph service at stations not taking observations, indications officers will send, if practicable, signal orders to such stations on or before 5 p. m., daily, except Sunday, and on Sundays before 10 a. m.

137. The indications officer will send with all cautionary or on-shore signal orders, and as often during the display as he considers necessary, to the following stations: Duluth; Milwaukee; Mackinaw City; Detroit; Cleveland; Oswego; Boston; New Haven; Norfolk; Savannah; Cedar Keys; New Orleans; Marquette; Chicago; Alpena; Toledo; Erie; Eastport; Nantucket; New York City; Wilmington; Jacksonville; Pensacola; Galveston; Escanaba; Grand Haven; Port Huron; Sandusky; Buffalo; Portland, Me.; New London; Baltimore; Charleston; Key West; Mobile; a telegram giving, as near as possible:

(1) The location of the storm-center and probable direction it will move.

(2) The probable direction of wind in next eight or sixteen hours, and the direction it is expected to shift.

(3) The probable time the storm will cease to be dangerous.

(4) The probable state of weather in next eight or sixteen hours, whether rain, snow, or fog, and whether higher or lower temperature.

138. When cautionary signals are ordered up or down at the stations on the lakes or the Gulf, notification will be sent by telegraph to other stations in the same locality, as directed below. The notification, besides the information that "up" or "down signals," &c., are ordered for other stations, will contain so much of the explanatory message embraced in the cautionary order as will be of general importance to the stations receiving it.

139. When cautionary signals are ordered up or down at any of the stations on the Gulf coast, viz., Key West, Cedar Keys, Pensacola, Mobile, New Orleans, Galveston, and Indianola, notifications will be sent to all of these stations, except Indianola, when the indications officer considers it probable that the storm for which the signals are ordered will cause dangerous winds in the region of the station to be notified. This paragraph refers only to stations taking observations.

140. When cautionary signals are ordered up or down on the lakes, notifications will be sent to stations as follows:

(1) Signals ordered on Lake Superior, to stations on Lakes Superior, Huron, and Michigan; (2) signals ordered on Lake Michigan, to stations on Lakes Michigan, Huron, and Erie; (3) signals ordered on Lake Huron, to stations on Lakes Huron, Erie, and Ontario; (4) signals ordered on Lake Erie, to stations on Lakes Erie, Ontario, and Huron, and to Mackinaw City; (5) signals ordered on Lake Ontario, to stations on Lake Ontario. When cautionary signals have been ordered at one or more stations on one of the lakes and due notification has been given, notification of the ordering of additional signals on that lake will not be sent to stations on other lakes. These notifications apply to orders to dis-

play, or lower, cautionary signals only, and not to on-shore signals. This paragraph refers only to stations taking observations.

141. The kind of signal shown at Sandy Hook, N. J., will be the same as that at New York City. (Ins. 1, 1884.)

142. All cautionary signals received at Indianola, Tex., will be repeated to the observer at Brownsville, Tex. (Ins. 19, 1885.)

143. The officer in charge may give a more extended notification of the ordering of signals when, in his opinion, necessary. (Ins. 91, 1882.)

144. Display boards showing stations where cautionary signals are up, together with the kind of signal, will be kept in the indications division. (L. R. 6679, Mis., 1884.)

145. The officer in charge will verify the orders for display and discontinuance of signals and the record on the cautionary-signal board, after which the order will be numbered and entered in the cautionary-signal order book and sent to the telegraph room.

146. At midnight, after completing the press report and special telegrams, and issuing the necessary signal orders, if any, the "good-night" message will be prepared, copied in the "signal-order book," verified, and sent to the telegraph room.

147. Cautionary signals will be ordered for Baltimore, Md., whenever a storm is anticipated on the Delaware, Maryland, or Virginia coasts. They will be considered justified if the wind reaches the verifying velocity at any station within that section.

148. The observer at Key West, Fla., is authorized, except when signals are ordered by the indications officer, to display and lower cautionary signals at that station at his discretion, reporting such action immediately by telegraph to this office. Each telegram will contain all essential information of the movement and character of the storm. (Ins. 171, 1881.)

149. Cautionary-signal orders for Nantucket will be made out on Form No. 206, in the same manner as stations receiving orders direct.

150. The following form (No. 206) is used in sending signal orders:

[Form No. 206.]

WAR DEPARTMENT, SIGNAL SERVICE, U. S. ARMY,
Washington, D. C., ——— ———, 188—, — m.

To Observer:

Indianola,	N. J. Coast Section,	Erie Section,
Galveston,	Sandy Hook,	Cleveland,
New Orleans,	New York City,	Sandusky,
Mobile,	New Haven,	Toledo,
Pensacola,	New London,	Detroit,
Cedar Keys,	Newport Section,	Saginaw Bay Section,
Key West,	Narragansett Section,	Port Huron,
Jacksonville,	Nantucket,	Alpena,
Jacksonville Section,	Wood's Holl Section,	Mackinaw City,
Savannah,	Boston,	Grand Haven,
Savannah Section,	Boston Section,	Grand Haven Section,
Charleston,	Portland,	Mackinaw Section,
Wilmington,	Portland Section,	Chicago,
Wilmington Section,	Eastport,	Milwaukee,
Norfolk Section,	Oswego,	Milwaukee Section,
Norfolk,	Oswego Section,	Green Bay Section,
Fort Monroe,	Rochester,	Escanaba,
Baltimore,	Buffalo,	Marquette,
Chincoteague,	Erie,	Duluth.
Cape Henlopen,		

Hoist	Cautionary,	Northeast,	Signals down.
	On-shore,	Southeast,	
Change	On-shore to Cautionary,	Southwest,	
	Cautionary to On-Shore,	Northwest,	

Here follows a telegram giving, as near as possible: (1) The location of the storm-center and probable direction it will move. (2) The probable direction of wind in next eight or sixteen hours, and the direction it is expected to shift. (3) The probable time the storm will cease to be dangerous. (4) The probable state of weather in next eight or sixteen hours, whether rain, snow, or fog, and whether higher or lower temperature.

....
....
....
....

(Signed) ——— ———.

Time filed, ———. Time ordered to station, ———.
By order of the Chief Signal Officer.

STORM WARNINGS (CANADIAN SERIES).

151. Whenever the conditions indicate dangerous weather in the Dominion of Canada, a message will be transmitted to the superintendent of the meteorological service, Toronto, Canada.

152. The following cipher will be used to indicate the districts or stations threatened:

Collingwood, for Georgian Bay; Saugeen, for Lake Huron; Kingston, for East Ontario; Toronto, for West Ontario; Stanley for Lake Erie; Montreal; Quebec; Father Point; Gaspe; Bathurst; Shediac, for North New Brunswick; St. John; Pictou, for North Nova Scotia; Halifax; Sydney; Yarmouth; Newfoundland.

153. The time and date at which a storm is expected to arrive at the districts or stations threatened will be given in the words, morning, afternoon, or midnight of —— (day of month).

Example of dispatch.

154. Storm (or severe storm) indicated for Saugeen, Collingwood, Stanley, afternoon of 4th; Toronto, Kingston, midnight of 4th; Montreal, Quebec, morning of 5th.

155. When danger is past or no longer threatens any Canadian station that has been warned, a dispatch will be sent to the superintendent of the meteorological service, Toronto, Canada, containing the following:

(1) Safety; (2) name of station or stations; (3) time, and (4) date. A "good night" message will also be sent to the superintendent of the meteorological service, Toronto, Canada, at midnight.

156. The officer in charge will verify all dispatches relating to storm warnings and the record on the cautionary-signal board, after which a copy of the dispatch will be entered in the signal-order book. These dispatches will not be numbered.

157. On Sunday a telegram will be sent at or before 9.30 a. m., giving the following information: If there be no definite warnings for Canadian stations based on the current reports and no expectation that there will be any founded on the afternoon reports of the same day, and any warnings sent on the previous day have been acknowledged, the absence of danger will be expressed by the words "nothing coming." If the morning reports do not make the immediate issue of warnings necessary, but indicate that there is a fair probability that a warning may be necessary after the receipt of the afternoon reports, this information will be expressed by the words "Sunday evening," with the names of the stations at which the warning will probably be needed. Warnings based on the current reports will be sent in the usual manner. (Cir. 23, 1874.)

STORM WARNINGS (MISCELLANEOUS).

158. The indications officer will telegraph to the United States Fish Commission, Wood's Holl, Mass., warnings of impending or threatened storms in the region off the south coast of New England. (Mem., July 1, 1884.)

159. The indications officer will telegraph to the secretary of the Maritime Exchange, New York City, when reports indicate the approach of severe storms toward the Gulf and Atlantic coasts.

SEVERE LOCAL STORMS AND TORNADOES.

160. The indications officer will give special attention to conditions favorable to the development of severe local storms and tornadoes. When the reports justify the prediction of these storms they will form a part of the general indication, the prediction to be that "conditions are favorable for the occurrence of severe local storms or tornadoes," giving the names of the States where such storms are expected to occur. (Mem. 100, 1886.)

161. Whenever severe local storms are predicted, as provided for by Mem. 100, 1886, the indications officer will telegraph the prediction as a special message to all Signal Service stations, and to the directors of the Minnesota, Ohio, and Alabama State weather services, when located within the threatened regions.

UNUSUAL OR VIOLENT DISTURBANCES IN CENTRAL ILLINOIS.

162. Whenever the conditions indicate unusual or violent disturbance in the region of central Illinois special predictions will be telegraphed "charges collect" to the "Pantagraph," Bloomington, Ill. (Mem. 159, 1885.)

THUNDER-STORMS.

163. The officer in charge of indications will give special attention to the study of conditions likely to be followed by thunder-storms in the New England States during the months of June, July, and August. When thunder-storms are likely to occur a dispatch will be sent to the observer at Boston, Mass., in the following terms:

"Wednesday (or day of week), June 5 (or day of month), is appointed term-day for the thunder-storm observers of the New England Meteorological Society."

164. These dispatches should be sent on the day previous to the one announced as the "term-day." (Mem. 133, 1886.)

STORM WARNINGS AND IMPORTANT FORECASTS (NEWSPAPERS).

165. A list of the daily newspapers published throughout that portion of the country for which predictions are made, with the address and hour of publication for each, will be kept in the indications division for use of the indications officer when important forecasts or warnings are to be telegraphed to the publishers.

166. The above list will be furnished by the officer in charge of the stations division, who will direct the observer in charge of the station at Washington City to keep it corrected to date.

NORTHERS.

167. When "northers" are anticipated telegraphic warnings will be sent to the regions menaced, according to the following schedule:

Co-operating railroad.	Central distributing station.	Person addressed.
Burlington and Missouri River Railroad	Omaha, Nebr	General manager.
Atchison, Topeka and Santa Fé Railroad	Topeka, Kans	Superintendent of telegraph.
Missouri Pacific Railway	Saint Louis, Mo	Do.
Saint Louis and San Francisco Railway	Springfield, Mo	Do.
International and Great Northern Railway	Palestine, Tex	Assistant superintendent of telegraph.
Fort Worth and Denver City Railroad	Fort Worth, Tex	Superintendent of telegraph.
Texas and Saint Louis Railway	Pine Bluff, Ark	General superintendent.
Texas and Pacific Railway	Marshall, Tex	Superintendent of telegraph.
Houston and Texas Central Railway	Houston, Tex	General superintendent.
Galveston, Harrisburg and San Antonio Railway.	Houston, Tex	Do.
Mexican National Railway	Corpus Christi, Tex	Do.

168. Warnings of the approach of "northers" in the Mississippi and Missouri Valleys and the Southwest will be telegraphed to the observer at Saint Louis, Mo. (Mem. 103, 1885.)

RIVER CHANGES, FLOODS, AND LOW WATER.

169. The river reports and river changes will be recorded and published in feet and tenths.

170. Whenever the changes equal or exceed one foot they will be briefly noted in the synopsis. When the river is near or above the danger-line, or very low, at any place, all changes will be noted. When the probable changes may be of great importance they will also be mentioned in the special bulletin. (G. O. 28, 1873.)

171. The indications officer will carefully study the river changes for the previous years, with a view of determining the rate of movement of freshet waves.

172. He will call for special telegraphic river observations to be taken at such stations, and at such times as he may consider necessary. When river reports are to be discontinued he will notify the officer in charge of the stations division, who will issue the necessary orders. (Ins. 74, 1884.)

173. Telegraphic warnings will be sent to all stations within the districts menaced by dangerous floods; when floods are likely to occur in regions where there are no stations a warning will be sent to the signal station nearest to the threatened locality, with directions to give the widest publication.

174. Reports of Western floods will be telegraphed, by special message, to the observer at New Orleans, La. (Ins. 28, 1886.)

175. In order that proper action may be promptly taken when a dangerous rise in any navigable river east of the Rocky Mountains is anticipated, the indications officer will at once notify the officer in charge of stations when he begins telegraphing reports. He will also notify the same officer when these reports are discontinued. (Ins. 20, 1886.)

176. Whenever danger from floods in the Potomac River is anticipated, notice will be sent to the merchants of Georgetown, and to the press in Washington, &c., of such impending floods. A duplicate message will be sent by the officer in charge of indications to the superintendent of the United States carp ponds, through the Telephone Exchange and National Museum. (Ins. 17, 1884.)

FROSTS.

177. Officers will carefully study the meteorological conditions preceding damaging frosts. Such as threaten any crop or fruit will be announced in indications and by special telegraphic bulletins as early as practicable, and, if possible, two or three days in advance. These frost warnings will define the regions threatened, state the time, and distinguish between light frosts, killing frosts, and freezing weather. The officer in charge will call upon the other members of the indications board for their opinions as to the minimum temperature to be expected and the area threatened. (Ins. 154, 1881; Ins. 155, 1882.)

178. When frosts which may prove injurious to crops are likely to occur the special bulletin will contain special warnings of their approach, which the officer in charge of indications will telegraph to the observers at stations in the threatened districts, with directions to give them the widest distribution.

179. Whenever minimum temperatures of 40°, or less, with conditions favorable for frosts, are expected, warnings will be telegraphed to the centers named in the several schedules filed in the indications and telegraph divisions, as follows: for the fruit-growing regions, from November 15 to April 15; for the tobacco-growing regions, from September 1 to November 1, or until after killing frosts; for the sugar-growing regions, from October 1 to February 1, or until after killing frosts; for the fruit and vegetable districts about Chattanooga, Tenn., from September 15 to May 1; for districts about Georgetown, S. C., from October 1 to April 1. (Ins. 69, 1879; Ins. 128, 1882; Ins. 6, 21, 24, and 31, 1883.)

180. The frost-warnings for the sugar-growing regions of Louisiana will be telegraphed to the signal service observer at New Orleans, who will promptly furnish copies to associations interested. The officer in charge of indications will exercise great care in preparing these warnings and make them descriptive of the conditions expected to occur in the northern and southern parts of the State; he will also give the time at which the cold wave or frost will probably reach the State. Warnings will not be given unless light frosts are expected at least in the northern section of the sugar-growing region; and when the temperature will probably fall below, or to, freezing in any section of the sugar-growing region it will be so stated. (Ins. 123, 1884.)

181. Special frost warnings for the cranberry-growing regions of Wisconsin will be prepared and telegraphed to the observer at Milwaukee, who will distribute them, by telegraph, to selected points in the counties of Jackson, Monroe, Juneau, Adams, Waushara, Marquette, Green Lake, and Wood.

182. The warnings for all cranberry districts will cover a period of thirty-two hours in advance; if the frosts are expected to continue beyond that period, a new warning will be telegraphed. In preparing the warnings, the time at which the frost is expected to reach the cranberry-growing districts will be given.

183. As the most successful protection against frost, and the one generally employed by growers, is to cover the marshes with several inches of water and keep the same in motion, and as this precaution involves considerable expense and loss of time during the picking season, it will be necessary to use great caution in making frost predictions for the benefit of this industry.

184. The picking season begins about September 1, and lasts about six weeks. This is a period of great danger, as the least frost ruins the fruit. (6421, Obs., 1885.)

185. Frost warnings for the State of Alabama will be prepared and telegraphed to the director of the Alabama State weather service, Auburn, Ala. (Mem. 201, 1885.)

186. Special frost warnings will be prepared for Iowa, Minnesota, Dakota, and other extreme Western States, and telegraphed to the observer at Pittsburg, Pa. (Ins. 22, 1885.)

187. The following form (No. 224 *b*—1886), showing the present arrangement for the distribution of frost-warning messages, will be used in preparing these messages:

[Form No. 224 *b*—1886.]

Frost-warning message.

SIGNAL OFFICE, WAR DEPARTMENT,
Washington City, ——— ———, 188—, —. *m.*

Cranberry districts (May 1 to November 1).—To observers, Boston, Mass.; Philadelphia, Pa.; Milwaukee, Wis.

Tobacco districts (September 1 to November 1).—Hartford, Conn., to manager Western Union Telegraph Company; New Haven, Conn., to observer; Palmer, Mass., to manager Western Union Telegraph Company; Springfield, Mass., to manager Western Union Telegraph Company; Elmira, N. Y., to manager Western Union Telegraph Company; New York City, to observer; Philadelphia, Pa., to observer; Harrisburg, Pa., to manager Western Union Telegraph Company; Harrisburg, Pa., to superintendent telegraph, Reading Railroad Company; Lancaster, Pa., to manager Western Union Telegraph Company; York, Pa., to manager Western Union Telegraph Company; Wilmington, Del., to manager Western Union Telegraph Company; Washington City, to observer; Lynchburg, Va., to observer; Richmond, Va., to manager Western Union Telegraph Company; Richmond, Va., to superintendent Richmond and Danville Railroad; Raleigh, N. C., to manager Western Union Telegraph Company; Cincinnati, Ohio, to observer; Lexington, Ky., to manager Western Union Telegraph Company; Louisville, Ky., to observer; Nashville, Tenn., to observer; Memphis, Tenn., to observer; Hannibal, Mo., to manager Western Union Telegraph Company; Saint Louis, Mo., to observer; Madison, Wis.

Sugar districts (October 1 to April 1).—New Orleans, La., to observer; Galveston, Tex., to observer; Columbia, Tex.

Fruit and vegetable districts.—Chattanooga, Tenn., to observer (September 15 to May 1); Charleston, S. C., to observer (October 15 to April 15); Georgetown, S. C. (October 1 to April 1); Jacksonville, Fla., to observer (November 15 to April 15).

Tobacco warnings—Special—(September 1 to November 1.) Asheville, N. C. (charges collect); Asheville, N. C. (charges collect); Alabama, Auburn, Ala., via Atlanta; in extreme Western States, notify observer, Pittsburg, Pa.

188. Whenever frosts are expected in the vicinity of any place to which predictions of the weather and temperature are sent, the indications officer will add the frost warning to the dispatch.

RECORD OF FIRST FROSTS.

189. During the autumn and winter the indications officer will have entered, on a special chart, the first light and killing frosts reported, with the dates of their occurrence.

FREEZING TEMPERATURES IN CANAL REGIONS.

190. During the period of navigation when freezing temperatures are anticipated in any canal region, special forecasts will be made in the indications and special bulletin.

COLD WAVES.

191. During his tour of duty, the officer in charge of the indications division will make a study of approaching changes of temperature as indicated in the Northwest, Montana, Manitoba, and Dakota, and adjacent sections, with a view of determining rules of value in predicting cold waves. A careful study of the charts on file for past years will probably indicate practical rules of great value. Each indication officer will read and carefully study Signal Service Notes No. 22. In connection with the foregoing he will include a special study of atmospheric changes which precede frosts. (Ins. 100, 1884; Mem. 78, 1884.)

192. Whenever a cold wave is expected to occur at any of the stations named below, the officer in charge of the indications division will telegraph the observer in the following form: "Hoist cold-wave signal; temperature will probably fall —— degrees during next —— hours."

193. Cold-wave signals will not be ordered unless a temperature of 45° or less is expected. When the temperature is expected to fall 20° or more in any district and not reach 45° the officer in charge of the indications division will announce "a cool wave approaching." The announcements will be made in the "Special Bulletin" and "Indications." No signals will be displayed for cool waves. (L. R. 4071, Sig., 1885; Ins. 27, 1885.)

194. Cold-wave signals will be verified by a fall of fifteen degrees (15°) or more after eliminating the diurnal change of temperature. (714 and 2280, Sig., 1886; Ins. 14, 1886.)

195. When the temperature has reached the minimum the cold-wave signal will be ordered down by telegraph, thus: "Cold-wave signal down." (Ins. 105, 1884.)

196. A display board showing where cold-wave signals are up will be kept in the indications division. (L. R. 6679, Mis., 1884.)

197. Cold-wave signal orders will be entered in the cold-wave signal-order book, and will be checked in the book, and with the display board by the indications officer, after which they will be sent to the telegraph room. (L. R. 6679, Mis., 1884.)

198. Cold-wave signal orders for Wellington, Kans., will be sent from this office direct.

199. The following stations cannot be reached by telegraph at midnight: Abilene, Tex.; Auburn, Ala.; Concordia, Kans.; Dodge City, Kans.; Greencastle, Ind.; Lamar, Mo.

200. Cold-wave signal orders for Washington City will be filed in the telegraph division and with the observer, who will notify the several newspapers.

201. The following form (Form No. 224*d*), showing the present arrangement for the distribution of cold-wave signal orders, will be used in preparing these orders:

[Form No. 224 *d*—1885.]

Whenever a cold wave is expected to occur at any of the stations named in this blank the officer in charge of the indications division will telegraph the observer in the following form: "Hoist cold-wave signal; temperature will probably fall —— degrees during the next —— hours." When the temperature has reached the minimum the signal will be ordered down by telegraph, thus: "Cold-wave signals down."

Cold-wave signal message.

SIGNAL OFFICE, WAR DEPARTMENT,
Washington City, —— ——, 188—, — m.

To observer—

Cheyenne, Wyo.
North Platte, Nebr.
Valentine, Nebr.
Yankton, Dak.
Denver, Colo.
Dodge City, Kans.
Omaha, Nebr.
Concordia, Kans.
Wellington, Kans.
Leavenworth, Kans.
Kansas City, Mo., to dispatcher, Fort Scott and Gulf Railway.
Lamar, Mo.
La Crosse, Wis.
Saint Paul, Minn.
Madison, Wis.
Dubuque, Iowa.
Des Moines, Iowa.
Davenport, Iowa.
Keokuk, Iowa.
Springfield, Ill.
Saint Louis, Mo. (repeating to Missouri State weather service for interior of State).
Cairo, Ill.
Milwaukee, Wis.
Chicago, Ill.
Grand Haven, Mich.
Logansport, Ind.
Greencastle, Ind.
Indianapolis, Ind.
Louisville, Ky.
Cincinnati, Ohio.
Columbus, Ohio.
Pittsburg, Pa.
Memphis, Tenn.
Nashville, Tenn.
Chattanooga, Tenn.
Knoxville, Tenn.
Detroit, Mich.
Toledo, Ohio.
Sandusky, Ohio.
Cleveland, Ohio.
Erie, Pa.
Buffalo, N. Y.
Rochester, N. Y.
Oswego, N. Y.
Albany, N. Y.
New York City.
Philadelphia, Pa.
Baltimore, Md.
Washington City.
Lynchburg, Va.
Richmond, Va., Chamber of Commerce.
Norfolk, Va.
Portland, Me.
Boston, Mass.
New London, Conn.
New Haven, Conn.
Fort Smith, Ark.
Little Rock, Ark.
Shreveport, La.
Galveston, Tex.
Abilene, Tex.
Palestine, Tex.
New Orleans, La.
Vicksburg, Miss.
Montgomery, Ala.
Auburn, Ala.
Atlanta, Ga.
Mobile, Ala.
Charlotte, N. C.
Augusta, Ga.
Wilmington, N. C.
Charleston, S. C.
Savannah, Ga.
Jacksonville, Fla.
Sanford, Fla.

HOIST COLD-WAVE SIGNAL. COLD-WAVE SIGNAL DOWN.

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....

SPECIAL DISTRIBUTION OF COLD-WAVE WARNINGS.

202. Notifications in regard to cold waves will be sent to the addresses on the list furnished to the indications division.

203. Whenever cold waves are expected in the vicinity of any place to which predictions of the weather and temperature are sent, the indications officer will add the cold-wave warning to the dispatch; but notifications to lower cold-wave signals in these cases will not be sent. (9081, Sig., 1885; Ins. 73, 1885.)

THE INDICATIONS BOARD.

204. The indications board will be permanently organized, and will be composed of the officers stationed in Washington City who have been announced in orders as "Assistants." A majority of the officers present for duty shall constitute a quorum for the transaction of business.

205. One officer of the indications board will be detailed to verify the official indications and signal orders of all kinds. One officer of the indications board will be assigned in charge of the indications division. This detail will not continue more than one month.

206. During the month previous to his assignment to indications division the officer will study all the charts of past years for the month during which he is to be on duty, and during that time he will prepare and furnish for publication in the "Monthly Weather Review" a brief paper containing the results of his study, not to occupy more than one page of the Review.

207. The members present will assemble at 10 o'clock a. m., daily, in the indications room, to study and discuss current meteorological conditions.

208. The senior officer present will preside at the meetings of the board; the junior officer present will act as recorder of the board. The officer in charge of the indications division will be responsible for all indications, signal orders, and special bulletins during his tour, availing himself of the advice of the board when he so desires.

209. It is the duty of any member of the board to notify the officer in charge of the indications division of any weather indications which he thinks may have escaped attention.

210. All indications and reports from the indications board, including the record of its daily meetings, will be signed by the president and recorder.

211. The proceedings of the board, at its daily meetings, will be placed before the Chief Signal Officer before 12 o'clock noon, each day.

212. The officer in charge of verifications will determine the percentage of verification of indications and the percentage of signals justified, in accordance with the following instructions:

213. The indications will apply to the States or Territories, or parts of States or Territories named, and the percentage of verifications will be determined for each State or Territory, or parts of State or Territory, named in the prediction.

214. Predictions will be made for the following States and Territories which will be named in indications in the order given, and they will be verified by stations as indicated below:

Maine: to be verified by Eastport and Portland, Me.

New Hampshire: to be verified by Boston, Mass., and Portland, Me.

Vermont: to be verified by Albany, N. Y.

Massachusetts: to be verified by Albany, N. Y., and Boston, Mass.

Connecticut: to be verified by New London, Conn., and New York City.

Rhode Island: to be verified by New London, Conn., and Block Island, R. I.

Eastern New York: to be verified by Albany and New York City.

Eastern Pennsylvania: to be verified by Philadelphia, Pa.

New Jersey: to be verified by New York City, Atlantic City, New Jersey, and Philadelphia, Pa.

Delaware: to be verified by Philadelphia, Pa., and Chincoteague, Va.

Maryland: to be verified by Baltimore, Md., Washington City, and Chincoteague, Va.

District of Columbia: to be verified by Washington City.

Virginia: to be verified by Washington City, Lynchburg, Norfolk, and Chincoteague, Va.

North Carolina: to be verified by Charlotte, Hatteras, Kitty Hawk, Wilmington, and Macon, N. C.

South Carolina: to be verified by Charleston, S. C., Augusta, and Savannah, Ga.

Georgia: to be verified by Atlanta, Augusta, and Savannah, Ga., Montgomery, Ala., and Jacksonville, Fla.

Eastern Florida: to be verified by Jacksonville and Cedar Keys, Fla.

Western Florida: to be verified by Pensacola, Fla.

Alabama: to be verified by Chattanooga, Tenn., Montgomery and Mobile, Ala.

Mississippi: to be verified by Vicksburg, Miss., Memphis, Tenn., New Orleans, and Mobile, Ala.

Louisiana: to be verified by Vicksburg, Miss., Shreveport, and New Orleans, La.

Texas: to be verified by Galveston, Indianola, Rio Grande City, Brownsville, San Antonio, and Palestine, Tex.

Arkansas: to be verified by Fort Smith and Little Rock, Ark., and Memphis, Tenn.

Tennessee: to be verified by Memphis, Nashville, Chattanooga, and Knoxville, Tenn.

Kentucky: to be verified by Nashville, Tenn., Cairo, Ill., Louisville, Ky., and Cincinnati, Ohio.

West Virginia: to be verified by Pittsburg, Pa.

Western Pennsylvania: to be verified by Pittsburg and Erie, Pa.

Western New York: to be verified by Erie, Pa., Buffalo, Rochester, and Oswego, N. Y.

Ohio: to be verified by Cincinnati, Columbus, Cleveland, Toledo, and Sandusky, Ohio, and Pittsburg, Pa.

Indiana: to be verified by Chicago, Ill., Indianapolis, Ind., and Louisville, Ky.

Illinois: to be verified by Chicago, Springfield, and Cairo, Ill., Davenport and Keokuk, Iowa, and Saint Louis, Mo.

Eastern Michigan: to be verified by Grand Haven, Alpena, Mackinaw City, Port Huron, and Detroit, Mich.

Western Michigan: to be verified by Duluth, Minn., Escanaba and Marquette, Mich.

Wisconsin: to be verified by Saint Paul, Minn., Escanaba, Mich., La Crosse and Milwaukee, Wis.

Minnesota: to be verified by Moorhead, Saint Paul, Saint Vincent, and Duluth, Minn., and La Crosse, Wis.

Iowa: to be verified by Des Moines, Davenport, and Keokuk, Iowa, Omaha, Nebr., La Crosse, Wis., and Yankton, Dak.

Missouri: to be verified by Saint Louis and Lamar, Mo., Cairo, Ill., Leavenworth, Kans., and Keokuk, Iowa.

Nebraska: to be verified by Omaha, Valentine, and North Platte, Nebr., and Yankton, Dak.

Kansas: to be verified by Dodge City, Concordia, and Leavenworth, Kans., and Lamar, Mo.

Colorado: to be verified by Cheyenne, Wyo., Denver, West Las Animas, and Montrose, Colo.

Eastern Dakota: to be verified by Huron, Yankton, and Bismarck, Dak.

Indications for the Pacific coast will be prepared for—

Washington Territory, and will be verified by stations located within said Territory.

Oregon: to be verified by stations in Oregon.

Northern California: to be verified by stations north of the latitude of 36°.

Southern California: to be verified by stations located south of the latitude of 36°. (Ins. 27, 1886.)

215. In determining the percentages of verification of predictions, the conditions occurring during the twenty-four hours predicted for, as shown by the charts for the 2d, 3d, and 4th reports following the report on which the prediction was made, will be carefully examined by the verifying officer, who will ascertain whether the conditions predicted for each State or Territory, or part of State or Territory, have prevailed in it to the amount of one-fourth, one-half, three-fourths, or the entire area under consideration. The area for which the prediction is made will be considered in verifying weather and temperature; any fraction of area less than one-quarter will be rated 1; over one-quarter and less than one-half, 2; over one-half and less than three-quarters, 3; and over three-quarters, 4. The barometer indications will not be verified, as the prediction is left optional with the indications officer.

216. In determining the percentage of verification of predictions of wind-direction the verifying officer will note the directions reported on the three charts to which the prediction applies, and will ascertain whether the directions observed fulfill the prediction, as follows: If the direction predicted is observed at one-quarter of the observations reported from the stations on the three charts under consideration the percentage of verification will be rated 1; over one-quarter and less than one-half, 2; over one-half and less than three-quarters, 3, and over three-quarters, 4.

217. In determining the total monthly percentages of verifications for all the predictions, the percentage of verification for each State for weather will be multiplied by five; for temperature, by four, and for wind-direction, by one; and the sum of all these will be divided by ten.

218. In applying the foregoing rules, a prediction of fair weather will be construed to indicate an absence of appreciable rainfall. If precipitation is predicted and one hundredth of an inch, or more, is reported on any one of the three charts considered in the verification, the prediction will be completely verified for the portion of the area covered by the rainfall reported. If no precipitation is reported on any of the three charts considered in the verification, the prediction will be rated a failure. Inappreciable rainfall will not be counted as precipitation

"Fair weather, followed by rain," or "rain, followed by fair weather," may be predicted, and in such cases, the percentage of verifications will be determined, as indicated in the following table:

First chart.	Second chart.	Third chart.	Sum for prediction of fair weather followed by rain.	Sum for prediction of rain followed by fair weather.
Fair.	Fair.	Fair.	2	2
Fair.	Rain.	Fair.	2	2
Fair.	Fair.	Rain.	4	0
Rain.	Fair.	Fair.	0	4
Rain.	Rain.	Fair.	0	4
Rain.	Fair.	Rain.	2	2
Rain.	Rain.	Rain.	2	2
Fair.	Rain.	Rain.	4	0

219. Precipitation may be indicated by the use of the following terms: "Light rain," "light showers," "light snow," "local rains" or "local snows," "showers," "rain," "general rain," "heavy rain," "heavy rain or snow," "heavy snows."

220. Lower temperature, or colder, will indicate that the temperature will be lower at the expiration of the twenty-four hours for which the prediction was made than at the commencement of that period. The prediction will be completely verified if the temperature falls one degree or more over the area under consideration.

221. Higher temperature, or warmer, will indicate that the temperature will be higher at the expiration of the twenty-four hours for which the prediction was made than at the commencement of that period. The prediction will be completely verified if the temperature rises one degree or more over the area under consideration.

222. Predictions may be made for "lower, followed by higher, temperature," or for "higher, followed by lower, temperature," and in such cases the percentages of verifications will be determined as indicated in the following table:

First chart.	Second chart.	Third chart.	Sum for prediction of lower followed by higher temperature.	Sum for prediction of higher followed by lower temperature.
Rise.	Rise.	Rise.	2	2
Rise.	Rise.	Fall.	0	4
Rise.	Fall.	Rise.	2	2
Rise.	Fall.	Fall.	0	4
Rise.	Rise.	0 change.	2	2
Rise.	0 change.	Rise.	2	2
Rise.	0 change.	0 change.	0	2
Rise.	0 change.	Fall.	0	4
Rise.	Fall.	0 change.	2	4
Fall.	Fall.	Fall.	2	2
Fall.	Fall.	Rise.	4	0
Fall.	Rise.	Fall.	2	2
Fall.	Rise.	Rise.	4	0
Fall.	Fall.	0 change.	2	2
Fall.	0 change.	Fall.	2	2
Fall.	0 change.	0 change.	2	0
Fall.	0 change.	Rise.	4	0
Fall.	Rise.	0 change.	4	2
0 change.	0 change.	0 change.	0	0
0 change.	0 change.	Rise.	2	0
0 change.	0 change.	Fall.	0	2
0 change.	Fall.	0 change.	2	2
0 change.	Rise.	0 change.	2	2
0 change.	Fall.	Fall.	2	2
0 change.	Rise.	Rise.	2	2
0 change.	Rise.	Fall.	0	4
0 change.	Fall.	Rise.	4	0

STATIONARY TEMPERATURE.

223. The prediction for stationary temperature is completely verified if the change at the close of the twenty-four hours is not more than 5°.

WINDS.

The prediction for winds will be made, and the percentage of verifications determined, as follows:

224. The quadrant from which the wind is expected to blow must be named, and no prediction, except for variable winds or when the prediction is divided, will apply to more than 90°.

225. In the verification of predictions of wind-directions calms will not be considered, except in the case of variable winds, in which case they verify the prediction.

226. The prediction of north winds will include northwest, north, and northeast winds; the prediction of northeast winds will include north, northeast, and east winds; the prediction of east winds will include northeast, east, and southeast, and so on for the other quadrants.

227. When the prediction is made—"winds shifting to southerly," "winds changing to southerly," "winds becoming southerly," or other direction, the prediction will be completely verified if the last chart shows the direction named. If only the second chart shows the direction named, the prediction will be rated 2, and if only the first chart shows this direction it will be counted 1. If only the first and second charts show this direction it will be rated 3.

228. A variable wind for a single station is one which shifts more than ninety degrees during the twenty-four hours for which the prediction is made. When two or more stations are embraced in the prediction, the directions at the stations must differ from each other more than ninety degrees.

VERIFICATIONS OF STORM WARNINGS.

229. The statement showing percentage of signals justified will also show the number of storms for which signals were not ordered. The percentage will be computed separately for each class of signals.

230. An on-shore signal will be considered justified when the wind at the station is in an on-shore direction, with a velocity of 20 miles, or more, per hour. They will not be justified as to velocity unless the verifying velocity occurs with the wind in an on-shore direction.

231. If, during the display of an on-shore signal, the velocity of the wind at the station equals the verifying velocity for cautionary signals for that station, it will be counted as a storm for which cautionary signals should have been ordered, although the on-shore signal will be considered justified (if the direction of wind is on-shore).

232. The percentage of cautionary and cautionary-direction signals will be computed, the latter for each quadrant, and both as to direction and velocity.

233. A cautionary-direction signal may be justified as to velocity and not justified as to direction, but a direction signal cannot be justified as to direction unless the wind reaches the verifying velocity in the quadrant named.

234. Cautionary signals are verified as to velocity only.

235. When the wind reaches the verifying velocity at any station within 100 miles of a station at which cautionary or cautionary-direction signals are displayed the signal will be considered justified as to velocity.

236. Observers at coast stations will telegraph, with the next regular report, the maximum velocity and its direction when the wind reaches or exceeds the verifying velocity.

237. Observers at lake stations will telegraph, at the next regular report, the maximum velocity, with the direction, when the wind reaches or exceeds 20 miles per hour.

238. Cautionary signals ordered for Baltimore, Md., will be considered justified if the wind reaches the verifying velocity at any station on the Delaware, Maryland, or Virginia coasts. (6492, Sig., 1886.)

239. The several lists for the distribution of storm-signal orders, cold-wave signal orders, frost warnings for tobacco and cranberry districts, &c., will be revised to date, and kept posted up in the indications division; and will be corrected from time to time on the memorandum order of the Chief Signal Officer, issued by the officer in charge of the correspondence and records division.

ADDENDA.

Insert after paragraph 55:

55*a*. On Chart 2 enter outside and near the circles for each station the current departure, which is the difference between the current barometer and normal barometer for month and hour of report, as shown on the auxiliary charts. This departure is denoted by the sign + if the current barometer be higher than the normal, and by the sign — if less.

55*b*. A carbon line of double weight will be drawn between the + and — departures through points where the barometer is normal, with the sign + and — each on its appropriate side.

Insert after paragraph 62:

62*a*. On Chart 3 enter at the right of the station the current departure, *i. e.*, the difference between the current actual temperature and the normal temperature for the month and hour of report, as shown on the auxiliary charts. This departure will be preceded by the sign + if the current actual temperature be higher than the normal, and by the sign — if lower.

62*b*. A carbon line of double weight will be drawn between the + and — departures through points where the temperature is normal, with the signs + and — each on its appropriate side.

W. B. HAZEN,
Brig. and Bvt. Maj.-Gen'l, Chief Signal Officer, U. S. Army.

Official:

J. MITCHELL,
Second Lieutenant, Signal Corps, U. S. Army.

APPENDIX 3.

ANNUAL REPORT OF OFFICER IN CHARGE OF DIVISION OF LOCAL AND STATE WEATHER SERVICES CO-OPERATING WITH THE SIGNAL SERVICE.

OFFICE CHIEF SIGNAL OFFICER,
Washington City, June 30, 1886.

SIR: I have the honor to submit herewith my report of the operations of State weather services co-operating with the Signal Service during the year ending June 30, 1886.

These services have met with encouraging success in a number of the States, and the general interest taken in the subject of these local organizations leads me to believe that there will be a substantial increase in the number of these services during the ensuing year. The object of these services has been fully realized, and they now form important features of the general weather service for the distribution of weather forecasts, frost, cold-wave, and storm warnings, in many sections of the country, especially agricultural regions, where it would be impossible for this service to otherwise furnish these warnings. Many of these services receive daily indications by telegraph from this office, and they are distributed over the State without expense, and for this distribution this service is indebted to the co-operation of many lines of railroad.

The number of stations at which meteorological observations are taken has largely increased, and the data thus collected are utilized in the preparation of the State bulletins, and also in the preparation of the Monthly Weather Review of this service. State services are now in operation in nineteen States, and are partially organized in eight States. It is to be regretted that this service has not a fund from which instruments could be purchased for the use of State observers, as it is frequently impossible to secure stations at important points owing to the inability of the observers to supply instruments. This service should also be able to provide flags to indicate the character of weather and symbols for the display on railroads when co-operation may be secured. Many of these organizations have undertaken special studies of climatology and meteorology based upon the data collected, and the results of such studies are a practical value to the Signal Service, the stations of which are so limited in number and so widely separated that they only serve to present the general weather conditions existing over the United States. These services are of especial value to the people of the States where they are in operation. The cost of maintaining them is insignificant when compared with the resulting benefits, and it is only through such organizations that the farmers of this country will be able to utilize the worth of the Signal Service. Millions of dollars may be saved annually in agricultural sections by wide distribution of the weather forecasts, and there are instances of record where a single dispatch conveyed warnings which enabled individuals to save crops of tobacco, sugar-cane, and cranberries valued at hundreds of thousands of dollars. There was an instance which came under my personal observation (I wrote the dispatch myself) where this service gave timely frost warnings to a tobacco region, and for want of an organization similar to these State services that dispatch remained in the center of the tobacco region in the drawer of the telegraph operator, and thirty-six hours after its receipt the whole crop of tobacco was lost by frost, when it might have been saved by cutting.

The great problem of the Signal Service is to devise means for the distribution of the information which is daily collected at the central office. Year after year the predictions are issued from the central office indicating higher or lower temperature for the succeeding day. No distinction was made to indicate the difference between a slight fall in temperature and a cold wave until December, 1883, when a cold-wave signal and its advantages were recommended in my letter to you from Chicago. The advantages following the adoption of this signal have rendered it one of the most important features of the Signal Service. The State services will add still more to the usefulness of this signal by giving its warning to people more distant from the centers of population. In the wheat-growing region of the country the State services will be able to supply weekly and monthly reports of temperature and rainfall, which will prove of great value to the growth of the crop.

With a view of securing uniformity in the methods of conducting these services a convention of the chiefs of State weather services was held in this city February 24 and 25 of the current year, which was well attended and resulted in improvements which are now being carried out. A general summary of the proceedings of this convention accompanies this report. As it is proposed to increase the efficiency of the State weather services by the detail of a Signal Service observer as assistant to the chief of each service, and as a number of new services are now in process of organization, it is recom-

mended that a second convention similar to that above referred to be held in this city some time during the month of February, 1887.

Referring to the early history of State weather services and their connection with the Signal Service, I respectfully submit the following extract from my letter to the Chief Signal Officer of the Army, dated January 27, 1881, upon which was based your first official action in regard to these services:

* * * * * * *

(1.) "Secure the favorable action of the legislatures of the several States, requiring each county recorder to take observations of temperature, maximum and minimum, rainfall and wind, at stated hours, the same to be furnished to the Chief Signal Officer on postal cards printed at this office. This would not only enable this office to study the climatology of the whole country, but at the end of ten years would enable it to make very complete charts of rainfall and temperature for every section. This would not only increase the usefulness of the service, as these reports could be collected weekly, but an auxiliary service could be organized in each State, under the direction of this office, which would tend to increase the importance of the Signal Service in every section of the country."

* * * * * * *

The following are detailed reports of the several chiefs of State services for the year ending June 30, 1886.

I am, very respectfully, your obedient servant,

H. H. C. DUNWOODY,
First Lieutenant, Fourth Artillery,
Acting Signal Officer and Assistant.

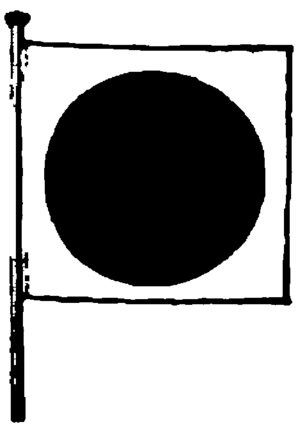
The CHIEF SIGNAL OFFICER OF THE ARMY,
Washington, D. C.

[Circular.]

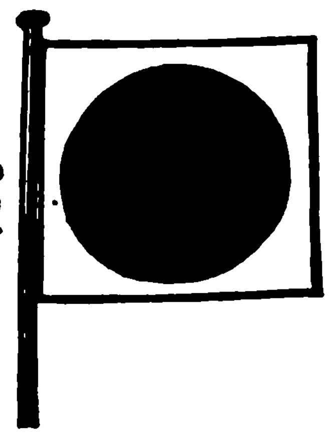
SIGNAL OFFICE, WAR DEPARTMENT,
Washington City, November 1, 1885.

WEATHER AND TEMPERATURE SIGNALS.

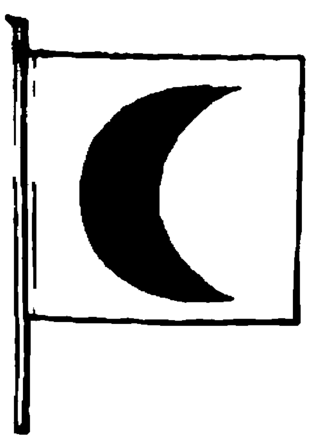
Upon the urgent demand of those interested in weather and temperature changes, the Chief Signal Officer of the Army has furnished, when possible, the "Indications," at 1 a. m. daily, of the temperature and weather for the ensuing thirty-two hours to many railroads, postmasters, and others in such form that they could be readily converted into signals. Insufficiency of appropriations has, however, greatly crippled efforts in this direction, and has prevented this office from furnishing the necessary signal flags to indicate probable weather conditions. The flags for this purpose should be six in number, not less than 6 feet square, and of the following colors:



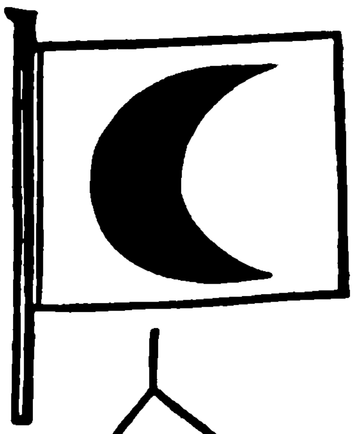
No. 1. White flag with large red sun in center, to indicate "Higher Temperature," or warmer weather.



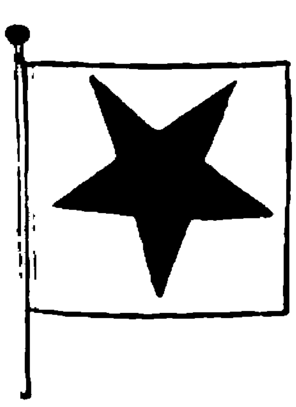
No. 4. White flag with large blue sun in center, to indicate "General Rain (or Snow)."



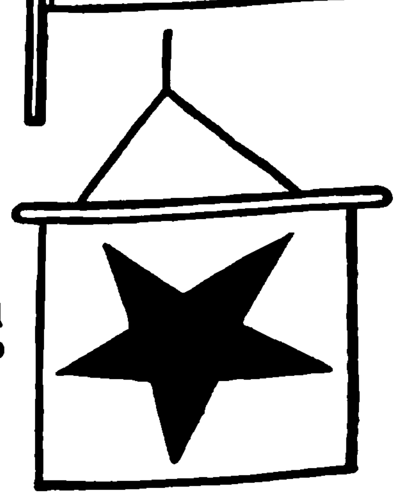
No. 2. White flag with red crescent in center, to indicate "Lower Temperature," or colder weather.



No. 5. White flag with blue crescent in center, to indicate "Clear or Fair Weather."



No. 3. White flag with red star in center, to indicate "Stationary Temperature."



No. 6. White flag with blue star in center, to indicate "Local Rain (or Snow)."

In displaying weather and temperature signals only two flags should be hoisted at one time. If more than one kind of weather or temperature is predicted, the last-named kind will decide which flag to hoist.

The position of the flags in any hoist will have no significance, as each flag designates a specific condition of weather or temperature in whatever position it may be placed.

During a calm, or when the wind is light, the signals cannot be readily distinguished; and if flags are hung as shown by the blue star signal on the above cut, it will be found to be satisfactory for any velocity of the wind.

There being no funds at the disposition of the Chief Signal Officer for the purchase of the flags, if they are desired and cannot be secured in the vicinity, the set of six may be obtained for—

Thirteen dollars from M. G. Copeland & Co., No. 634 Louisiana avenue, Washington, D. C. (standard bunting);

$15 from Crane & Co., McWhorter & Oliver streets, Newark, N. J.;

$15 from C. S. Decker, No. 168 State street, Boston, Mass.;

$15 from Horstman Bros. & Co., Fifth and Cherry streets, Philadelphia, Pa. ("Eagle" bunting);

$15 from John F. McHugh, No. 1286 Broadway, New York City.

Correspondence in relation to these flags should be had direct with the above firms and not through this office.

As the weather indications are telegraphed daily to a large number of the stations of the Signal Service, to railroads, post-offices, &c., there are very many small towns which could, by proper arrangement, obtain them by telephone or otherwise from the Signal Service stations, railroad stations, or post-offices receiving the reports and displaying the flags. Places not reached through any of these mediums desiring to display the signals should correspond with the Chief Signal Officer in reference to the subject, when, if possible, action will be taken to furnish the indications as soon as the necessary flags have been obtained and arrangements made for their display.

The system here outlined and now in successful operation at various places could, by a little exertion and a small outlay for flags on the part of those who would be benefited by the signals, be extended indefinitely and become one of the most valuable aids to the farmer, the merchant, and the public generally. This system has been adopted and is used by some of the principal railroads throughout the country, disks made of steel or iron being displayed from the baggage cars. These roads transmit over their wires each morning to the points from which trains start the kind of symbols to be displayed, the baggage masters at those points attending to the changing of them.

Many large firms and corporations are displaying these signals, introducing them (and at the same time advertising their business) by printing the signals and their meaning on the back of their business cards.

Communications in reference to the display of signals and symbols should be addressed to—

W. B. HAZEN,
Brig. and Bvt. Maj. Gen'l, Chief Signal Officer, U. S. A.

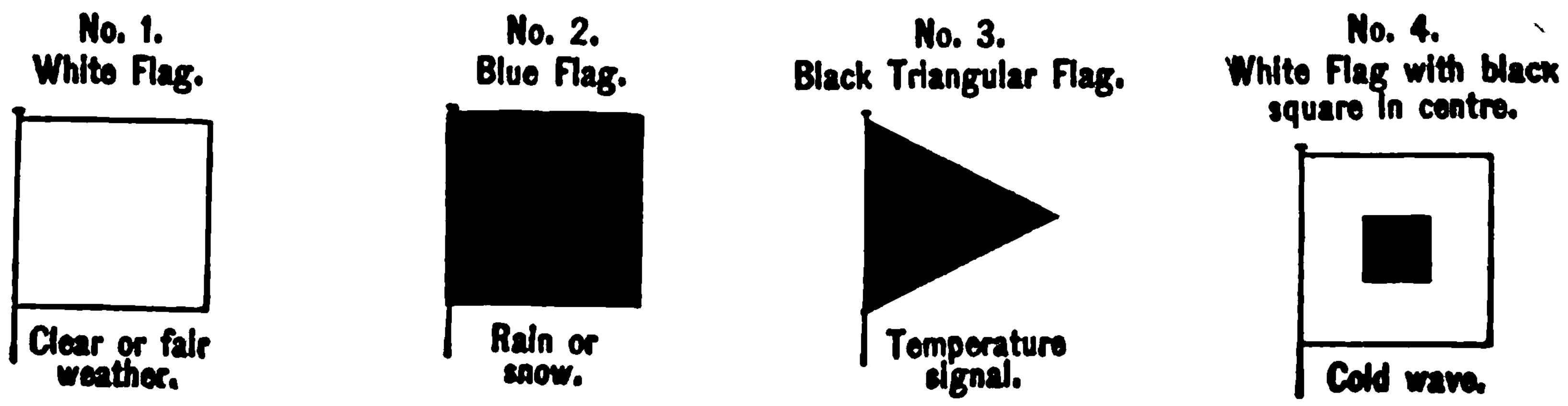
[Circular.]

SIGNAL OFFICE, WAR DEPARTMENT,
Washington City, November 10, 1886.

Weather signals adopted for general use by the Signal Service on and after March 1, 1887. With a view of securing a uniform system of signals it is recommended that flags now in use be replaced by those herein described as the former become worn out or unserviceable.

The Chief Signal Officer furnishes, when practicable, for the benefit of the general public and those industries dependent to a great extent upon weather conditions, the "Indications," which are prepared at this office daily, at 1 a. m., for the twenty-four hours commencing at 7 a. m. These weather forecasts are telegraphed to many Signal Service stations, railway officials, and others, and are so worded as to be readily communicated to the public by means of flags or symbols. The flags adopted for this purpose are four in number and of the form and dimensions indicated below:

INTERPRETATION OF SIGNALS.



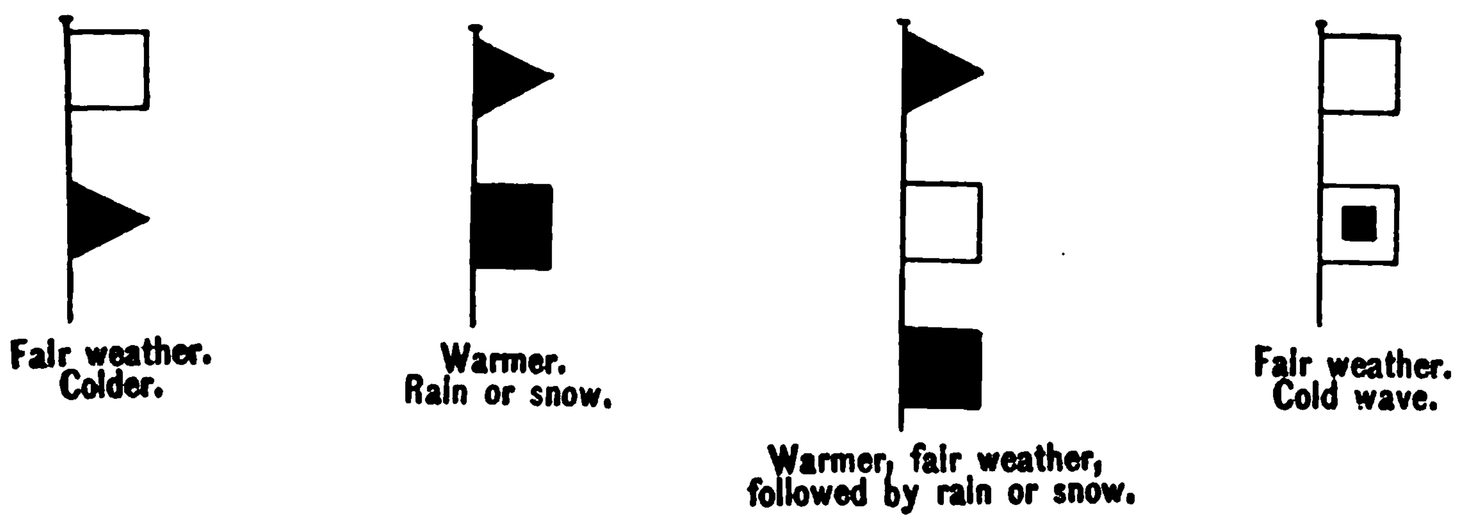
No. 1, white flag, 6 feet square, always indicates clear or fair weather, no rain. No. 2, blue flag, 6 feet square, indicates rain or snow. No. 3, black triangular flag, 6 feet at the base and 6 feet in length, always refers to temperature. When placed above Nos. 1 or 2 it indicates warmer weather; when placed below Nos. 1 or 2 it indicates colder weather; when not displayed, the indications are that the temperature will remain stationary, or that the change in temperature will not vary 5 degrees from the temperature of the same hour of the preceding day. No. 4, cold-wave flag, 6 feet square, indicates the approach of a sudden and decided fall in temperature. This signal is usually ordered at least twenty-four hours in advance of the cold wave. It is not displayed unless a temperature of 45 degrees, or less, is expected, nor is flag No. 3 displayed with it.

When displayed on flag-poles the signals should be arranged to read downward; when displayed from horizontal supports a small streamer should be attached to indicate the point from which the signals are to be read; when in the form of symbols, to be displayed on cars, the symbols should be placed one above the other and read downward.

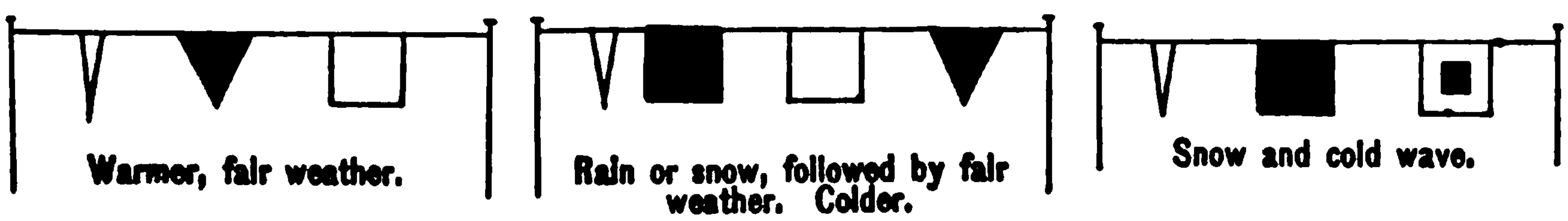
The signals may be withdrawn at 3 p. m.

EXAMPLES.

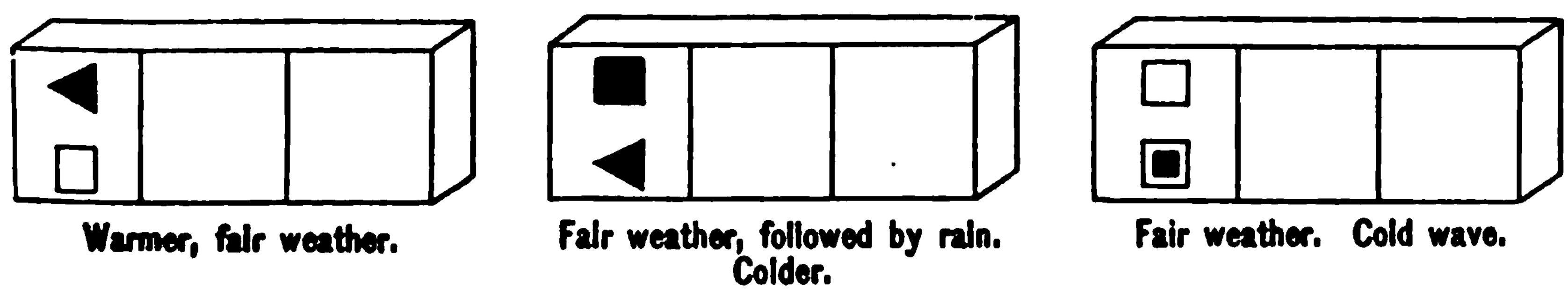
Displayed from poles.



Displayed from horizontal supports.



Displayed on cars.



When the two weather symbols cannot be displayed show the one indicating the weather last named in "Indications."

As the weather indications are telegraphed daily to a large number of stations of the Signal Service, to railroads, &c., in various sections of the country, there are many small towns where they may be obtained by telephone, free of expense. Those desiring to

display weather signals and not able to obtain the indications as above, should communicate direct with the Chief Signal Officer, and if it is not practicable to telegraph the indications, at the expense of the United States, to such places, they will always be furnished at Government rates, at twenty cents per message, sent collect.

Weather signals are now displayed at many stations throughout the United States, and this improved system, which is based on that devised by Prof. P. H. Mell, Jr., of Alabama, has been adopted with a view of securing uniformity, and is recommended, after a careful test of the several systems now in use, and submitted for examination. The system is not complicated, the solid colors will secure legibility, and the flags may be supplied at small expense.

There being no funds at the disposition of the Chief Signal Officer for the purchase of flags, if they are desired and cannot be procured in the vicinity, they may be purchased from any of the following firms, at prices ranging from $6 to $12 per set:

M. G. Copeland & Co., No. 634 Louisiana avenue, Washington, D. C. (standard bunting).

Crane & Co., McWhorter and Oliver streets, Newark, N. J.

C. S. Decker & Co., No. 168 State street, Boston, Mass.

Horstman Bros. & Co., Fifth and Cherry streets, Philadelphia, Pa. ("Eagle" bunting).

John F. McHugh, No. 1286 Broadway, New York City.

S. Hemmingway, No. 60 South street, New York City.

P. H. Mell, Jr., Auburn, Ala.

Correspondence in relation to these flags should be had direct with the above firms, and not through this office. The flags may be made of cotton cloth at an expense not to exceed $2 per set. The displays here outlined may be greatly extended and become one of the most valuable aids to farmers, shippers, and the public generally by a little exertion and a small expense for flags on the part of those who would be benefited by the signals. Weather signals have been adopted and are in use by some of the principal railroads throughout the country, the symbols, made of tin or sheet iron, being displayed from the baggage car. These roads transmit over their wires each morning to points from which trains start the names of the symbols to be displayed, the baggage-masters at those points attending to the signals. Many large firms and corporations are displaying these signals and at the same time advertising their business by printing the signals and their meanings on the back of their business cards.

Communications in reference to the display of signals and symbols should be addressed to

W. B. HAZEN,
Brig. and Bvt. Maj. Gen'l, Chief Signal Officer, U. S. Army.

ALABAMA.

POLYTECHNIC INSTITUTE AND AGRICULTURAL
AND MECHANICAL COLLEGE,
Auburn, Ala., June 9, 1886.

SIR: In a letter just received from Lieutenant Dunwoody I am requested to furnish you with a brief account of the operations of the State service during the year, &c.

The service has now thirty-seven observers that are doing valuable work, and consisting of some of the most prominent men in the State.

A large amount of valuable data has been accumulated at the central office that will be of great service hereafter in determining the climate of the State.

The monthly bulletins have been issued regularly, with special bulletin occasionally, on subjects of special interest to the farmers of the State.

The distribution of the weather and temperature predictions has been attended to regularly each day. No new roads, however, have been added to the system since January, 1886, because your orders to me were to discontinue such work until further orders. The roads and corporations now receiving these daily warnings are as follows: South and North Railroad; Montgomery and Mobile Railroad; Mobile and Girard Railroad; Georgia Pacific Railroad; East Tennessee, Virginia and Georgia Railroad, extending through Georgia; East Tennessee, Virginia and Georgia Railroad, extending through Alabama; Memphis and Charleston Railroad; Columbus and Western Railroad; Atlanta and West Point Railroad (the stations on this road catch the telegram as it is transmitted from Washington); Northwestern Railroad of Georgia; Western and Atlantic Railroad of Georgia; Montgomery and Eufaula Railroad; Pensacola and Selma Railroad; Pensacola and Atlantic Railroad; the cities of Milledgeville, Ga., and Talladega, Ala. Those railroads entering Atlanta, Ga., receive the warnings from the observer at that point. The Georgia Railroad and the Central Railroad of Georgia were also parts of my system, as well as the Savannah, Florida and Western Railroad, but in accordance with your orders they were turned over to the observers at Augusta and Savannah, Ga.

In the matter of this signaling system there have been many difficulties with which to contend, and some of them have been insurmountable, the chief of which has been the irregular transmission on the part of the Western Union Telegraph Company. Although I had so many stations at the close of last year throughout this State and Georgia, today I have not one-half the number in operation.

The people very readily bought the flags and had them raised, but the telegrams were received by them so irregularly that they became discouraged and lost interest in the prediction and very soon ceased to raise the signals. Every effort on my part to counteract this effect has proved a failure, because I could not guarantee the prompt attention on the part of the Western Union. For instance, in the transmission of the telegrams from Auburn to Birmingham the messages would be delayed both at Montgomery and Birmingham, and frequently it would be in the afternoon before the railroad authorities would receive my instructions. Unless the warnings are put in the railroad office before 8 a. m. the business of the road will retard the distribution very materially. It is my intention to visit all stations belonging to my system this summer and try to revive an interest in this important branch of the service; but unless something is done to obviate the difficulty already stated I see but little use in undertaking the work. If you will glance at a map of Alabama and Georgia you will see that the railroads now belonging to my system cover almost every portion of the country. Without any additional expense, except the purchase of the flags, three hundred and twenty-five towns and villages can be benefited by these predictions, and this is all accomplished by the expense now incurred by the Chief Signal Officer. Much interest is manifested in the service whenever the work is kept up regularly, and many complaints have come to me from all sections clamoring for remedies. I inclose copies of bulletins that will give you items in regard to the service under my charge that will be of use to Lieutenant Dunwoody in his annual report.

Very respectfully submitted.

P. H. MELL, JR.,
Director Alabama Weather Service.

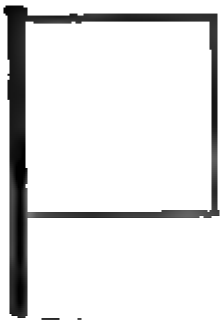
CHIEF SIGNAL OFFICER,
Washington, D. C.

List of meteorological stations of the Alabama State weather service.—Auburn, Birmingham, Bermuda, Carrollton, Centre, Chattanooga, Decatur, Evergreen, Eufaula, Fayette, Florence, Gadsden, Grove Hill, Goodwater, Greensboro, Jacksonville, La Fayette, Lineville, Livingston, Marion, Mobile, Montgomery, Newton, Oswichee, Prattville, Roanoke, Russellville, Springville, Selma, University of Alabama, Troy, Tuscumbia, Trinity, Union Springs, Valley Hill, Mount Willing.

Alabama weather service.

CENTRAL OFFICE, AUBURN.

[Weather signals. Preserve for reference.]

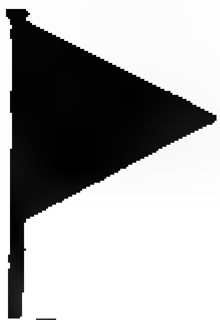
1

Fair or clear weather.

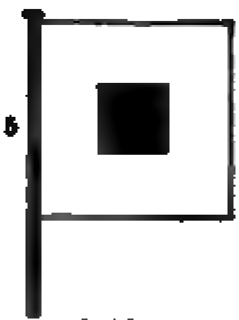
2

Local rains.

3

General rains.

4

Temperature signal.

5

Cold wave signal.

EXPLANATION OF SIGNALS.

PREPARATION OF INDICATIONS.

The weather indications furnished to the State by the Chief Signal Officer are based on observations taken in all parts of the country three times a day. The morning indications are prepared at 1 a. m. (eastern standard time) and hold good till the following morning.

DISPLAY OF FLAGS.

In accordance with these indications the proper official flags, illustrated on the reverse side of this card, should be selected and promptly displayed. If elevated on a pole, they should be so arranged as to read downward. If the indications read ——— ——— followed by ——— ———, then a space, the width of a flag, should be left vacant on the pole to indicate "*followed by.*" The signals should be withdrawn at 3 p. m.

MEANING OF FLAGS.

No. 1 [white flag] refers always to Fair or Clear Weather.

No. 2 [orange flag] refers always to Local Rains.

No. 3 [blue flag] refers always to General Rains.

No. 4 [black triangular flag] refers always to Temperature. When placed above either Nos. 1, 2, or 3 indicates Rising Temperature; when placed below these numbers (1, 2, or 3) indicates Falling Temperature; when absent from the pole Stationary Temperature is indicated.

No. 5 [white flag with black square] refers always to decidedly colder weather, and is generally issued twenty-four hours in advance of the expected fall of temperature.

This signal is not ordered unless it is expected that the temperature will fall to forty-five degrees, Fahrenheit, or below, within the time stated in the order.

* No. 6 [orange flag with black square] indicates the approach of a cyclonic wave.

EXAMPLES.

"Cooler, fair weather," display flag No. 1 with No. 4 below it.

"General rains, higher temperature," display No. 3 with No. 4 above it.

"Stationary temperature and local rains," display No. 2 only.

"Stationary temperature and general rains, followed by cooler clear weather," display No. 3 (space) and No. 1 with No. 4 below it.

Public notice of these explanations should be secured in local newspapers as generally as possible, and by posting this card near the point of display where it can be examined by the public.

P. H. MELL, JR.,
Director Alabama Weather Service.

NEW ENGLAND METEOROLOGICAL SOCIETY.

CAMBRIDGE, MASS., *May* 31, 1886.

SIR: In reply to your favor of the 27th instant I have pleasure in making the inclosed statement, by circular and otherwise, of the condition of our society. To this I would add: Membership, about 100; bulletins, 19 published (including June, 1886); volunteer observers of thunder-storms (special investigation in co-operation with the United States Signal Service), about 500, mostly in addition to the 140 regular observers for bulletin; membership increasing; inclosures 4-7; in co-operation with the Appalachian Mountain Club especial attention will be given to the climatology of the White Mountain region; weather signals will be reported shortly.

Very respectfully,

W. M. DAVIS,
Secretary New England Meteorological Society.

Lieut. H. H. C. DUNWOODY,
Signal Office, Washington, D. C.

[Extract from the annual report of the director, Prof. Winslow Upton.]

During the past year the council has engaged in the following branches of work: 1. The securing of a corps of reliable observers of meteorological phenomena, with special attention to precipitation and temperature; 2. The publication of the monthly bulletin; 3. The dissemination of the daily indications of the United States Signal Service and the local display of weather flags; 4. The special investigation of thunder-storms. The work of securing reliable observations was so far advanced in November, 1884, as to warrant the issue of the first bulletin for that month, and its regular publication thereafter. The first bulletin contained reports from 45 observers; that for September, 1885, from 123 observers. Efforts have been constantly made to secure increased accuracy and greater uniformity in the observations, in order that they may furnish a reliable basis for future investigations. The subject of accurate instruments received early attention. After many experiments it was decided to manufacture a special class of rain-gauges rather than to adopt any now in the market; and to adopt, for self-registering thermometers, those of certain reliable firms. The experience of the year has fully justified this policy. All who were desirous of making observations have been encouraged to do so, irrespective of location, but efforts have also been made to secure observers in special localities. This would be an easier task if the society were able to furnish instruments, for the cost of instruments has sometimes prevented those interested from undertaking the work. The bulletin has been prepared on a uniform plan, with a few minor changes suggested in the progress of the work; in addition to the usual summary of the observations, each number has contained a map, prepared by the Secretary, showing the distribution of precipitation and temperature ranges.

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*The terms "Cyclone" and "Tornado" must not be confused. The first indicates a great storm moving the air particles toward the center of the disturbance in great circuits, the diameter of which is sometimes hundreds of miles in extent. Tornadoes are local disturbances in a cyclone. Sometimes near the center of a great storm, or cyclone, the general inward tendency of the air causes a violent whirlwind where the air revolves with such violence as to prostrate houses and trees and carry heavy objects to a great distance—this is a tornado. Its duration at any one place scarcely exceeds more than one minute, and the width of the path is seldom more than 100 yards.

The society has co-operated with the United States Signal Service in the dissemination of the daily indications and local display of weather flags. A member of the Signal Corps, Mr. O. N. Oswell, has been assigned to duty under the society's control; without his assistance this portion of the work would not have been undertaken. The aid thus given has been of great advantage in other departments of work, especially in the clerical labor attending the preparation of the bulletin and the special investigation of thunder-storms.

The Signal Service Observer at New Haven has also successfully labored to secure the display of weather flags in Connecticut in harmony with the society's plans. As a result, local weather flags are displayed in more than one hundred cities and towns of New England.

The special investigation of thunder-storms was made under the supervision of the secretary. The members of the National Academy who constitute the trustees of the Bache fund appropriated $200 for this work. More than four hundred observers co-operated, the largest number of reports for any single storm having been two hundred and three. The preliminary study of the reports thus far made indicates that some interesting results have been obtained, which will be reported upon subsequently.

The original membership of the society was 9; the number at the close of the year 95. The expenses of the society have been kept within its income, but this has been done through the generous co-operation of friends, who have from time to time contributed liberally to its resources.

In looking forward to the work of another year the council suggests that special efforts be made to add to the membership of the society as well as to the list of observers. It must be remembered that the financial prosperity of the society depends on the number of members. It is desired to include in the membership all who are interested in meteorological studies in New England, whether they make observations or not. A member need not be an observer, nor is it required that an observer shall be a member. The council expresses the hope that the second year of the society may be as successful as the one just ended, and sincerely thanks all who have contributed to its prosperity.

A monthly bulletin is published by the New England Meteorological Society, to which reference may be made to Tables I, II, III, and IV, for a list of observers, 144 in all, for April, 1886. This membership, with very few exceptions, increases every month since the publication of the bulletin was begun.

[Circular No. 4.]

NEW ENGLAND METEOROLOGICAL SOCIETY—PRESENT CONDITION OF THE SOCIETY—GENERAL STATEMENT.

The society was formed in 1884. Its constitution states that "its object shall be the cultivation of meteorological science in New England." Persons interested in this object are therefore invited to apply to the secretary for membership. The annual fee is $3. Members are entitled to attend and to vote at the meetings of the society and to receive a copy of its publications; members need not make observations, and residence n New England is not required.

The society acts in co-operation with the United States Signal Service, and occupies in New England the same position as that taken by the State weather services in other parts of the country. All voluntary observers of the Signal Service in New England are desired to report to the society. The society encourages the local display of weather signals, based on the daily predictions issued from the Signal Office in Washington. Correspondence concerning these signals in Connecticut should be addressed to the Observer, Signal Office, New Haven, Conn.; in other parts of New England, to the Observer, Signal Office, Boston, Mass.

The fundamental work of the society is the collection of systematic records of climatic elements, such as temperature, rainfall, and the like, made by trustworthy observers with accurate instruments. This work is in charge of the director, and about one hundred and fifty observers are now co-operating in it. Additional observers are desired, especially at points not now represented (see map on other side). Observers need not take membership in the society. The monthly bulletin is sent them without charge.

In order to insure accuracy of record, thermometers and rain-gauges belonging to observers regularly reporting to the society will be tested free of cost by Prof. S. W. Holman, of the Massachusetts Institute of Technology, Boston. All instruments bought through the society will hereafter be tested in this way. Correspondence concerning the purchase and testing of instruments should be addressed to the secretary.

A monthly bulletin, prepared by the director, is published by the society, containing a general statement of the weather for the month preceding that of its issue, a summary of observations collected, presented in tabular form, and a map showing graph-

ically the mean diurnal range of the temperature and the total amount of precipitation. The map from the bulletin of March, 1886, is reprinted on the other side of this circular. The bulletin is sent free to members and to regular observers; to others the subscription price is one dollar a year, payable to the treasurer.

The society holds regular meetings on the third Tuesday of October, January, and April, when communications of scientific interest are presented.

Special investigations may be undertaken from time to time. Those that the society is at present engaged in are the study of thunder-storms, under the direction of the secretary, and the examination of rainfall, temperature, &c., in general storms, by the director.

WM. H. NILES,
Massachusetts Institute of Technology, Boston, Mass., President,
WM. M. DAVIS,
Harvard College, Cambridge, Mass., Secretary,
DESMOND FITZGERALD,
M. Am. Soc. C. E., Brookline, Mass., Treasurer,
E. B. WESTON,
M. Am. Soc. C. E., Providence, R. I.,
WINSLOW UPTON,
Brown University, Providence, R. I., Director,
Council of the Society.

[Observations of thunder-storms in co-operation with the United States Signal Service: Second season—1886.]

Thunder-storms will constitute a subject of special investigation during the summer months on much the same plan as in 1885.

The phenomena of thunder-storms have been chosen for this study, as offering at once the greatest variety of features easily observed, and promising in return the most interesting results.

Volunteer observers to take part in the study are wanted in all parts of New England.

The desired observations are classified as follows:

Class A.—No instruments required. Simple records of the time of beginning and ending of rain, when thunder is heard first and loudest, and of the direction of wind and its changes.

Class B.—Ordinary instruments needed. A thermometer and a tin can for collecting rain. A somewhat more detailed record of rain, wind, temperature, thunder, &c., during the passage of a storm.

Class C.—Good instruments needed. Better measures of rain and temperature, with barometer readings if possible; and especially more careful observations on clouds.

This division into classes need not be closely followed. Observers of Class A may add, for example, temperature of Class B, or clouds of Class C, to their subjects of record.

Days when observations are wanted:

(1) Observations are to be taken through June, July, and August whenever a thunder-storm can be seen or heard.

(2) Observations are also desired at regular intervals from noon to 6 p. m. on certain days, whether a thunder-storm is in progress or not. These days will be called term-days; they will be appointed one and a half to two days in advance by special message from the Chief Signal Officer in Washington, and will be announced to the public by telegraphic reports to all newspapers of the New England Associated Press. They will be days on which thunder-storms are expected.

Instructions, blanks for observations, and stamped envelopes for returning the records to the Boston signal office will be distributed to volunteers in the latter part of May. Correspondents will be answered as promptly as possible, but a brief delay will sometimes be unavoidable.

Volunteers are requested to send in their names as early as possible. The inclosed franked envelopes may be used (without stamp) in returning the card of agreement, list of recommended observers, or other matter connected with this investigation. No one need hesitate to undertake the work from lack of practice, as the instructions give all necessary information, and the simpler class of records (A) can easily be kept by any intelligent boy or girl.

Special circulars addressed to yachtsmen and pilots and to amateur photographers may be had on application.

The council of the society requests the assistance of all persons interested in this investigation, not only in keeping records themselves, but particularly in extending the number of observers in their neighborhood.

W. M. DAVIS,
Secretary New England Meteorological Society, Cambridge, Mass.

[Observations of thunder-storms in co-operation with the United States Signal Service.—Second season, 1886.—Circular to New England newspapers.]

The council of the society asks the assistance of the newspapers of New England in making its plan of volunteer observations of thunder-storms known to their readers, and for this purpose requests the publication of extracts from the inclosed circular.

Special investigations of thunder-storms are in progress in a number of European countries, and have lately been instituted by the United States Signal Service.

In 1885 the New England Meteorological Society undertook a similar study, and received assistance from over three hundred volunteers. It is hoped largely to increase the number of observers this summer.

The desired observations are graded in three classes; the simplest class requires no instrumental observations; a share in the work is therefore within the reach of all intelligent persons who take an interest in the weather.

Term-days.—In order to secure observations in all parts of New England on days when thunder-storms are likely to occur, a special message will be sent from the Signal Office, Washington, announcing these days thirty-six to forty-eight hours in advance, and this message will be repeated from Boston to all newspapers belonging to the New England Associated Press. The days thus selected will be called *term-days for observers of the New England Meteorological Society.*

You are respectfully requested to aid in making the announcement of term-days public. Be kind enough to inform me of your willingness to do so. A list of the newspapers agreeing to print the term-day dispatches will be sent to all observers about the middle of May.

W. M. DAVIS,
Secretary New England Meteorological Society.

HARVARD COLLEGE,
Cambridge, Mass., April, 1886.

[Observations of thunder-storms in co-operation with the United States Signal Service. Second season, 1886. Announcement of term-days.]

Dispatches from the Signal Office in Washington announcing term-days for hourly observations will be worded about as follows:

Washington, June —, 1886. ——, June ——, is appointed term-day for the observers of the New England Meteorological Society.

(As has been explained in earlier circulars, term-days are those on which thunder-storms may be expected in some part of New England. Observations are desired on these days from all volunteers, according to instructions, whether thunder-storms occur or not.)

As soon as t e term-day dispatch is received in Boston it will be sent to the agents of the New England Associated Press and the United Press, and by them distributed to all their corresponding newspapers in New England, about fifty in number, so that very general publication will be gained. The message will generally be printed immediately after the paragraph giving the weather indications.

The following newspapers have expressed their willingness to publish the term-day dispatches:

Boston, Mass.: Advertiser, Globe, Herald, Journal, Post, Record, Transcript, Traveller. Fitchburg, Mass.: Sentinel. Lowell, Mass.: Citizen, Courier, Mail, Times. Holyoke, Mass.: Transcript. Manchester, N. H.: Mirror, Union. New Bedford, Mass.: Mercury. Newburyport, Mass.: Herald, Germ. Newport, R. I.: News. Pittsfield, Mass.: Journal. Portland, Me.: Argus, Press. Springfield, Mass.: Republican. Worcester, Mass.: Gazette.

It is suggested that observers who do not find their daily paper in the above list should inclose this circular to the editor of the daily paper that they take, and ask if the dispatches here described will be printed in it, so that the announcements will surely be received.

Observers are reminded of the importance of recording even apparently trivial phenomena, such as the occurrence of a light shower with moderate thunder, or the distant passage of a thunder-storm near the horizon. The true value of these records will appear when they are studied in connection with all others of the same date.

It is desired also to emphasize the importance of accurate record of rain-beginning and of the hourly observations on term-days, and (for classes B and C) the observations on the even hours and half-hours during thunder-storms. Much of the success of the investigation depends on the care of observers in these respects.

W. M. DAVIS,
Secretary New England Meteorological Society.

CAMBRIDGE, MASS., *May* 20, 1886.

[Observations of thunder-storms in co-operation with the United States Signal Service.—Second season, 1886.—Special circular to amateur photographers.]

The council of the New England Meteorological Society requests the assistance of experts in photography in securing views of the clouds in approaching and receding thunder-storms during the coming summer. Such photographs, studied in connection with the numerous reports gathered from volunteer observers throughout New England (see accompanying circular), will afford data for the determination of the form and altitude and something of the mechanism of our local storms.

Views are especially desired of the strongly developed storms that arise in the west after a noon of oppressive heat. The plan of work to be followed may thus be stated:

When the bank of storm clouds is visible in the west, and distant thunder is faintly heard, set the camera toward that point of the horizon above which the clouds rise highest. Note its direction carefully by compass, and, letting it remain in this position, take several views of the clouds as the storm approaches; repeat the process, with the camera facing in the opposite direction as the storm moves away. If the storm passes to one side of the observer, take a series of views toward the highest part of its clouds during its progress, noting the direction of the camera accurately at each exposure.

Record the time at which each view is taken as accurately as possible. The plates used should not be smaller than 5x8 inches, if possible. The views need not be of the highest artistic excellence; it will serve if they show the outlines of the cloud-masses with some distinctness.

The lens should be in all cases precisely opposite the center of the plate, and the plate should be at right angles to the line of sight, the swing-back not being used; the camera may be directed obliquely upward if necessary, but in this case the angle of elevation of the line of sight must be carefully determined. It would be well always to include the sky-line on the plate, and to determine the elevation of the sky-line above the true horizon. The views should be taken from an elevated point, or from the roof of a house, so as to command as uninterrupted a horizon as possible.

Views of lightning flashes are also desired; they may be obtained by exposing a plate at night, the camera being directed toward a storm, and waiting till a bright flash appears before covering the lens. Several flashes may be taken on one plate.

In order to determine the scale of the visual angle of the camera take a view of a house at a distance of one or two hundred yards, the line of sight being at right angles to the visible side of the house, the house being in the center of the field, and the distance to the house and the length of its side being carefully measured.

Those who are willing to take part in this investigation are requested to address

W. M. DAVIS,
Secretary New England Meteorolgical Society.

HARVARD COLLEGE, *Cambridge, Mass.*

BOSTON, MASS., *June* 7, 1886.

DEAR SIR: In reply to your card of 31st ultimo I would say that we have forty-five stations where the flags are displayed, and every little while I hear of new places not on our list. I think there must be fifty towns at least where they are displayed; besides this I find that the telephone people give the indications to a great many places where they don't display the flags, but bulletin them. This flag system seems to have taken the place of the old farmers' bulletin.

Yours truly,

OTTO B. COLE.

Prof. W. M. DAVIS,
Cambridge, Mass.

NEW ENGLAND METEOROLOGICAL SOCIETY,
Cambridge, Mass., June 3, 1886.

DEAR SIR: In regard to weather flags displayed in New England the following statement may be made as a supplement to my recent letters concerning our society work. The display of weather flags was begun early in 1885; they are now hoisted at forty-five stations in Massachusetts, New Hampshire, and Vermont, great aid in the distribution of the weather indications being given without charge by the New England Telephone and Telegraph Company. Sergeant Cole, of the Boston Signal Office, has recently taken charge of the display in these States. In Connecticut the display of these flags was inaugurated by Sergt. J. H. Sherman, New Haven Signal Office, in connection with the New England Meteorological Society; he secured generous assistance from the Standard Time and Electric Company of New Haven, over whose wires the daily messages were

sent without cost to towns where flags are hoisted by the operators of this company. I am at present unable to fill in the number of flag stations in Connecticut, Sergeant Sherman not yet having answered my letter of inquiry on this point.

I shall be very glad to see your report.

Very truly yours,

W. M. DAVIS,
Secretary.

Lieut. H. H. C. DUNWOODY.
Signal Office, Washington.

MINNESOTA WEATHER SERVICE.

GENERAL STATEMENT.

The Minnesota Weather Service is under the auspices of the Saint Paul Chamber of Commerce, and in co-operation with the United States Signal Service and the Minneapolis and Saint Louis Railway Company.

The central station is located at the Chamber of Commerce building, Saint Paul, with a United States signal officer in charge. The director's office is at Carleton College Observatory, Northfield.

In consideration of locating the central station of this weather service at its building in Saint Paul, the Chamber of Commerce agrees to furnish such aid, to offer such co-operation and supervision as are necessary for the efficient operation of a general and comprehensive weather service for the entire State. In accordance with these arrangements, already definitely made, the director, with the co-operation as aforesaid, respectfully submits the following plan of organization:

Stations.—The local stations of this weather service in the various towns and cities of this State are divided into two classes: (1) Observing Stations and (2) Flag Stations; all of which should be under the supervision of the local board of trade, city council, or some other suitable local organization, for financial support and oversight.

The local authorities supporting observing stations will be asked to procure a set of meteorological instruments, a set of signal-service flags for daily indications and warnings, a bulletin board for posting weather dispatches and daily local temperatures, and to secure and maintain an observer who will care for the instruments, observe them daily at the hours of 7 a. m., 2 p. m., and 9 p. m., and report on suitable blanks provided for that purpose, the observations once each week on the morning of ———, with any other meteorological phenomena that may have been observed. The local authorities supporting flag stations of this service will be asked to procure a set of signal-service flags, a bulletin board for daily telegraphic indications, and to secure and maintain competent persons to post the daily weather bulletins before 8 o'clock each morning, and to display at the same time appropriate flags for all predictions belonging to this class of stations. The persons in charge of flag stations will be asked to report on appropriate blanks to the central station on Monday of each week whether or not the predictions of each day of the preceding week were verified.

Central Station.—The signal officer in charge of the central station will, in general, discharge the following duties:

1. Co-operate with the director in completing the organization of the service.

2. Collect, reduce, tabulate, and summarize all meteorological data that may be of public use, and report the same weekly and monthly, as directed by the Chief Signal Officer and the director of the State service. He will also keep a record at the central station for public examination of the monthly averages of temperature, precipitation, and other meteorological data available for each local station of the service.

3. Except on Sunday, the central station will communicate by telegraph to local stations in the name of the director, the daily weather indications, and also cold wave warnings as soon as practicable after the same have been received from Washington.

4. As soon as possible a system of regular visitation of all local stations will be undertaken by the director, or the signal officer, to verify the character of local observations and test the condition of instruments.

5. Weekly summaries of useful meteorological facts and data will be distributed promptly to the newspapers of the State. A monthly bulletin, setting forth in a concise way the results of each month's observations, will also be published, in common with the practice of similar weather services in other States.

6. Local stations, to the extent of one in each county, may be organized on application to the central station in writing, signifying a willingness to accept the conditions and perform the duties of such stations, as indicated in this circular.

Meteorological instruments.—The meteorological instruments needed for local stations can be obtained at reduced cost, if purchased by the director of this State service through the Chief Signal Officer, Washington, D. C. Prices at present are as follows:

Signal Service barometer, vernier reading to 100th inch	$36 50
Thermometer:	
Minimum self-registering	4 60
Maximum self-registering	5 60
Wet bulb, cup, and support	5 10
Dry bulb and support	4 00
Rain gauge (copper overflow)	1 50
Wind vane (sunset)	8 00
Robinson's anemometer	26 05
Gibbon's self-recorder	28 55
Gravity battery (2 cups) and wire	2 50
Bulletin board for telegraphic dispatches (estimated)	5 00
Six flags for weather and temperature signals	15 00
Cold wave flag	2 50
Total cost	144 90

These prices do not cover cost of transportation of instruments from Washington, or the expenses of a signal officer to set up the instruments at local stations. The actual cost of these items only will be charged in addition.

WM. W. PAYNE,
Director Minnesota Weather Service.
THOS. COCHRAN, Jr.,
WM. F. PHELPS,
D. R. NOYES,
Committee of Chamber of Commerce.

Approved.

W. B. HAZEN,
Chief Signal Officer.

CARLETON COLLEGE OBSERVATORY, *March* 20, 1886.

Application for a local station in the Minnesota Weather Service.

The ——, of —— ——, hereby makes application to the director of the Minnesota weather service that an observing station or a flag station be forthwith located at ——; and that the same be equipped with the following meteorological instruments and apparatus, procured by the said director at the cost specified below:

Instruments.	Number.	Cost.
Signal Service barometer, vernier reading to 100th inch		
Thermometer:		
Minimum, self-registering		
Maximum, self-registering		
Wet bulb, cup, and support		
Dry bulb and support		
Rain-gauge (copper overflow)		
Wind-vane (sunset)		
Robinson's anemometer		
Gibbon's self-recorder		
Gravity battery (two cups) and wire		
Bulletin board for telegraphic dispatches (estimated)		
Six flags for weather and temperature signals		
Cold-wave flag		
Total		

The —— appoints —— —— as a suitable person to take charge of this local station, and agrees to pay for the services contemplated in this application —— per month. The —— also agrees, in case instruments are broken at this station, or in transit to it, to bear the loss and replace the same as soon as possible.

Minnesota Weather Service.

Application for a station at ——, instruments located at——, flags displayed on ——.

——— ———, *Observer.*

Compensation ——, by ——— ———.
Reports of ——— ———, on ———.
Weather and flag reports and correspondence about instruments, addressed Signal Officer, Minnesota Weather Service, Chamber of Commerce, Saint Paul.
All other correspondence should be addressed, William W. Payne, director, Northfield, Minn.

The Minnesota weather service, under the auspices of the Saint Paul Chamber of Commerce, co-operating with the United States Signal Service and the Minneapolis and Saint Louis Railway Company.

CENTRAL STATION AT CHAMBER OF COMMERCE BUILDING,
Saint Paul, March 1, 1886.

The director of the Minnesota weather service, with the approval of the Chief Signal Officer, Washington, D. C., has removed the central station of the weather service originally organized by Carleton College, Northfield, Minn., from that institution, and located the same permanently in the building of the Chamber of Commerce of Saint Paul. In consideration of this change, the Chamber of Commerce furnishes such aid and offers such co-operation and supervision as are necessary for the most efficient operation of a general and comprehensive weather service for the entire State.

In accordance with the above announcement, the director (in co-operation with the Chamber of Commerce committee) respectfully submits the following general statement for the information of the public:

This service consists at present of twenty-five stations partly or wholly equipped with standard meteorological instruments, purchased by the several local stations, and tested at the Chief Signal Office in Washington, D. C.

STATIONS.

There should be at least one complete station in each organized county of State, under the supervision of the local board of trade, city council, or board of education, for financial support and responsible oversight.

OBSERVERS.

A competent and responsible person should be chosen as observer for each local station, whose duties shall be to record the readings of instruments three times daily, and report the same, with other important meteorological facts, to the central station once a week, as provided for in the instructions from the Chief Signal Office.

In order to make the weather service as largely beneficial as possible, authority supporting each local station will be respectfully asked:

(1) To purchase such a set of flags as the Signal Service uses to display its indications.

(2) To prepare a bulletin board of suitable size and design, and place the same in a conspicuous place for posting daily weather dispatches.

(3) That the several stations shall cause these flags to be promptly and regularly displayed, and that all daily indications shall be placed on the bulletin board at some specified time in the early part of each day.

(4) It is also expected that each local station will bear all expenses for instruments, taking of observations, the posting of bulletins, and the display of flags for indications and warnings.

CENTRAL STATION.

For remainder of this circular, see page 78.

SAINT PAUL, MINN., *June* 1, 1886.

SIR: I have the honor to report for May, 1886, as follows: The work performed has been to canvass the State for flag and meteorological stations for the Minnesota weather service, to prepare for publication the report issued each month by the service, to attend to correspondence, and to prepare and deliver to the various railroads telegrams giving indications for Minnesota, Eastern Dakota, and Northern Iowa.

I was absent from this station May 11, 12, and 30.

I commenced delivering messages to the Chicago, Milwaukee and Saint Paul Railway May 10, 7 a. m.; the Minneapolis and Saint Louis Railway May 24, 7 a. m; C. A. Hoffman, Minneapolis, Minn., May 3, 7 a. m.

Following is list of stations on various lines now receiving telegrams and displaying signals:

Stations.	Commenced sending.	
	Date.	Hour.
Chicago, Milwaukee and Saint Paul Railway:		
Red Wing	May 10, 1886	7 a. m.
Winona	May 10, 1886	7 a. m.
Hastings	May 10, 1886	7 a. m.
Lake City	May 18, 1886	7 a. m.
Wabasha	May 18, 1886	7 a. m.
Minnesota and Saint Louis Railway:		
Watertown, D. T	May 24, 1886	7 a. m.
Gaylord, Minn	May 24, 1886	7 a. m.
Chamber of Commerce, Minneapolis, via—		
Chicago, Milwaukee and Saint Paul Railway	May 10, 1886	7 a. m.

The system of extending the benefits of the Signal Service to the rural districts and interior towns is decidedly beneficial to farming and other interests and highly appreciated by the general public.

Very respectfully, your obedient servant,

D. R. McGINNIS,
Private, Signal Corps, United States Army.

To the CHIEF SIGNAL OFFICER, U. S. A.,
Washington, D. C.

OHIO.

OHIO METEOROLOGICAL BUREAU, CENTRAL STATION,
Columbus, Ohio, June 9, 1886.

DEAR SIR: It gives me pleasure to comply with your request for information concerning the workings of this bureau for use in your report. The bureau owes its existence primarily to Prof. T. C. Mendenhall, formerly professor of physics of Ohio State University, Columbus, Ohio, now in the Signal Service Office, at Washington, D. C. His active interest in meteorology secured the interest and co-operation of the agricultural organizations of the State and resulted in the passage of an act by the general assembly April 17, 1882, creating the bureau and providing for its support. A copy of the act taken from the first annual report of the bureau is inclosed.

The first report issued was for the month of October, 1882, since which time monthly reports have been issued regularly. The bureau receives $2,000 annually from the State, out of which instruments for the equipment of stations have been purchased and current expenses paid. The only salary paid is that of the secretary. A list of the stations reporting is inclosed. The list gives the number and location of each station, date of establishment, latitude, longitude, elevation, and the name of the present observer. The observers are volunteers and have given their services without compensation. Their work has been done very faithfully, as the monthly reports show.

I also inclose a list of railroads carrying upon their baggage cars display signals, giving to the regions through which they run the Signal Service predictions for the day.

The system used is the "sun, moon, and star" set, now so well known throughout the country.

This service has given great satisfaction to the people along the lines making the display, and has called forth many warm commendations.

The bureau has from the first received substantial aid and encouragement from the Chief Signal Officer, General W. B. Hazen, without which some of its most valuable work would have been impossible. A year ago he offered to pay for daily telegrams of prediction to be sent to ten stations selected by the bureau. He has since authorized an increase of the number to thirteen. A message is received from Washington each morning, which is immediately repeated to each of the thirteen points, when the proper flags are displayed giving the predictions for the day.

A list of the places receiving these messages is inclosed, giving also the date of the first message sent and the address of those making the display.

If I have omitted anything you desire to have stated please inform me.

Very truly, yours.

BENJ. F. THOMAS,
Director Ohio Meteorological Bureau.

Lieut. H. H. C. DUNWOODY.

Annual report of the Ohio Meteorological Bureau.

In this the first annual report from the meteorological bureau of Ohio it is thought desirable to give a resumé of the history of the organization and work of the service up to the present time.

The bureau originated in the interest in scientific and practical meteorology on the part of many citizens of Columbus and the State, and in the desire of the Chief Signal Officer of the United States Army to increase the effectiveness of the national service by securing the co-operation of State organizations. A bill to bring about such an organization was introduced by the house committee on agriculture in the general assembly in the winter of 1882, and became a law on April 17 of that year.

The act establishing the bureau is as follows:

[House bill No. 481.]

AN ACT to establish a meteorological bureau for the State of Ohio.

SECTION 1. *Be it enacted by the general assembly of the State of Ohio,* That there be, and hereby is, established at the State University, at Columbus, Ohio, a central office for meteorological observation, with the professor of physics of said university, the secretary of the State board of agriculture, and a third person, to be appointed by the governor, as a board of directors; the members of the board of directors shall be commissioned by the governor, and be duly qualified as like officers of the State.

SEC. 2. The professor of physics of said university is hereby appointed president of the board, and by and with the advice of the directors shall establish, if practicable, one volunteer weather station in each Congressional district, and supervise the same; he shall receive reports therefrom, and reduce the same to tabular form and report the same monthly to the State printer for publication as the Ohio weather report, and shall annually make a report to the governor, which shall contain a detailed statement of all expenditures made during the year and a summary of the observations made at the various stations.

SEC. 3. That the supervisor of State printing be directed to print, under the contract with the State printer, 2,000 copies of each monthly report; 1,000 copies shall be distributed by said board, and 1,000 copies shall be delivered to the secretary of state, to be distributed by him in the same manner as other State documents.

SEC. 4. There is hereby appropriated for the ensuing year, for the establishment and maintenance of said bureau and stations, the sum of $2,000, or so much thereof as may be necessary for the purpose of meeting actual expenses of carrying out the provisions of this act; no part of said sum shall be paid for salaries of any officer or for office rent, but a reasonable part of the same may be paid for the services of a clerk at the central station.

SEC. 5. No money shall be expended, except under the order of the president director, by and with the approval of the board.

SEC. 6. This act shall take effect from and after its passage.

O. J. HODGE,
Speaker of the House of Representatives.
R. A. HORR,
President pro tempore of the Senate.

Passed April 17, 1882.

The passage of this act was recommended by Governor Foster in a special message to the general assembly, and it was also unanimously recommended by the State board of agriculture.

List of roads carrying signals.

Cleveland, Mount Vernon and Delaware Railroad: Four trains running from Columbus to Cleveland, and all points along the road receive the benefit of signals before 8.30 a. m. Signals are changed at Columbus, Cleveland, and Akron. No observer on line at this time.

Columbus, Hocking Valley and Toledo Railroad; two divisions.

First division: From Columbus to Toledo. Two trains daily. All points along this line are reached by 8 a. m. The signals are changed at Columbus and Toledo. The signals are reported from Carey by D. Pearce, agent of the railroad.

Second division: From Columbus to Athens. Two trains daily. All points along this division are reached by the trains before 9 a. m. of each day; the signals are put on at Columbus and Athens. The observers of signals of this division are W. H. Songenecker, Lancaster, and E. B. Clark, Athens.

The signals are also received on the Monday Creek branch of this division, Columbus and Cincinnati Midland Railroad. From Columbus to Cincinnati. Two trains daily. All points along the line of this road are reached by 9.30 a. m. The signals are changed at Columbus, Cincinnati, and Blanchester. In addition to sending the signals over the road George R. Car, general superintendent of Columbus, Hocking Valley and Toledo Railroad, and S. P. Peabody, general superintendent of Columbus and Cincinnati Midland Railroad, have had the predictions telegraphed over their roads by the train dispatchers, and many points have taken advantage of this kindness and display flags.

On the Columbus, Hocking Valley and Toledo Railroad; Delaware, Prospect, Marion and Fostoria are displaying flags, using the telegrams sent in this way.

On the Columbus and Cincinnati Midland Railroad, Mount Sterling and Wilmington are displaying flags, and Washington Court House is displaying a set of signals, as used on the baggage cars, from the telephone office, and also using a whistle, which is giving excellent satisfaction. All these points are receiving messages by the kindness of the superintendent of the railroad on which they are located.

When established.	Display stations.	Superintendents.
November, 1885	Zanesville, Ohio	Lewis F. Langley.
July, 1886	Canton, Ohio	S. V. Courtney.
July, 1886	Wauseon, Ohio	Thomas Mikesell.
July, 1886	Urbana, Ohio	S. L. P. Stone.
September, 1885	Youngstown, Ohio	A. G. Frost.
July, 1885	Pomeroy, Ohio	Dr. D. N. Allard.
September, 1885	Hamilton, Ohio	H. T. Berry.
July, 1885	Hillsboro, Ohio	E. L. Warson.
July, 1885	McConnellsville, Ohio	C. H. Morris.
January, 1886	Yellow Springs, Ohio	W. R. King.
April, 1886	Fultonham, Ohio	C. B. Fanley.
April, 1886	Coshocton, Ohio	Beach & McCabe.
May, 1886	Covington, Ohio	Aiken & Richeson.
May, 1886	Gallipolis, Ohio	J. H. Earnshaw.
July, 1886	St. Clairsville, Ohio	A. T. McKelvey.

The messages were transmitted to Hillsboro and McConnellsville from Columbus until May 15, when, by order of the Chief Signal Officer, they were discontinued, and the messages are forwarded to Hillsboro from Cincinnati, and those for McConnellsville from Zanesville. The messages to Yellow Springs were discontinued on the 5th day of June by order of the Chief Signal Officer.

List of stations reporting for the Ohio Meteorological Bureau, with latitude, longitude, elevation, time of establishment, equipment, and names of observers.

SIGNAL SERVICE STATIONS.

No.							Date of establishment.	Equipment.	Name of observer.
1	Cincinnati	39	6	84	26	620		Signal Service equipment.	Sergt. P. T. Jenkins.
10A	Toledo	41	40	83	32	651		do	Sergt. T. B. Jennings.
10B	Sandusky	41	27	82	43	630		do	Sergt. B. F. Hough.
13A	Columbus	39	58	82	59	804		do	Sergt. A. L. McRae.
21A	Cleveland	41	30	81	27	690		do	Sergt. Wm. Line.

OHIO METEOROLOGICAL BUREAU STATIONS.

No.							Date of establishment.	Equipment.	Name of observer.
2	College Hill	39	18	84	32	800	Mar., 1884	Bar., Max. and Min. Ther., Hygrometer, W. Vane, R. G	
3	Dayton	39	44	84	0	960	Oct., 1882	do	
4A	New Bremen	40	31	84	23	991	Oct., 1882	do	
4B	Sydney	40	15	84	7	960	Dec., 1882	do	
4C	Greenville	40	7	84	50	976	Dec., 1885	do	
5A	Upper Sandusky	40	44	83	16	880	Oct., 1882	do	
5B	Findlay	41	0	83	35	1,200	Feb., 1886	do	
6A	Wauseon	41	36	84	7	800	Oct., 1882	do	
6B	Paulding	41	9	84	36	734	Nov., 1883	do	
6C		41	22	84	7	682	Dec., 1885	do	Dr. T. O. Hunter.
7B		39	45	84	13	1,049	Jan., 1885	do	W. R. King.
8		40	13	83	31	1,030	Oct., 1882	do	H. G. Gowey.
9A		40	31	82	35	1,250	Oct., 1882	do	Noah C. Lavering.
9B		40	23	82	23	1,076	May, 1883	do	Prof. Theo. Sterling.
11A		38	32	82	38	543	Oct., 1882	do	James Bubb.
11B	Portsmouth	38	44	83	0	527	Sept., 1881	Bar., Max. and Min. Ther., Exp. Thermometer, W. Vane, R. G.	Dr. D. B. Cotton.
12B	Waverly	39	10	82	57	612	Dec., 1882	Bar., Max. and Min. Ther., Hygrometer, W. Vane, R. G.	H. W. Overman
12C	Georgetown	38	52	83	47	940	Dec., 1885	do	Dr. Thomas W. Gordon.
13B	Ohio State University	40	0	83	0	700	Oct., 1882	do	Wm. B. Alwood.
13C	Westerville	40	5	83	9	836	Dec., 1882	do	Prof. J. N. O. Haywood.
13D	Logan	39	35	82	19	730	Sept., 1883	do	Dr. James Little.
14	Oberlin	41	19	82	13	840	Oct., 1882	do	Prof. F. F. Jewett.
15A	Marietta	39	25	81	28	610	Oct., 1882	do	Prof. T. D. Biscoe.
15B	McConnellsville	39	50	81	40	704	Mar., 1884	do	C. H. Morris.
15C	Pomeroy	38	18	81	50		Apr., 1884	do	Dr. D. N. Allard.
16A	Granville	40	6	82	31	1,096	Oct., 1882	do	Prof. J. S. Gilpatrick.
16B	Newcomerstown	40	23	81	33	798	Feb., 1886	do	Dr. A. M. Beers.

17A	[illegible]	39	36	81	16	1,200	Oct., 1882	do	Joel Hall.
17B	[illegible]	40	15	80	43	....	Jan., 1883	do	Joseph Hooke.
18A	[illegible]	40	49	81	23	1,070	Oct., 1882	do	C. F. Stokey.
18B	[illegible]	41	6	80	39	655	June, 1885	do	A. G. Frost.
19A	[illegible]	41	15	80	47	901	Oct., 1882	do	Miss Laura P. Smith.
19B	[illegible]	41	44	80	45	934	Jan., 1884	do	Mrs. W. P. Howland.
19C	[illegible]	41	19	81	9	1,260	Nov., 1884	Bar., no Max., no Min. Ther., Hygrometer, W. Vane, R. G.	Prof. Geo. H. Colton.
20	[illegible]	40	49	81	40	1,063	Apr., 1883	Bar., Max. and Min. Ther., Hygrometer, W. Vane, R. G.	Prof. O. N. Stoddard.
21	[illegible]	41	30	81	27	636	Apr., 1883	do	G. A. Hyde.
12A	Washington C. H.	39	32	83	34	980	Dec., 1882	do	Emmer Edwards.

RAIN-GAUGE STATIONS.

Place.	Equipment.	Name of observer.	Place.	Equipment.	Name of observer.
Troy	Rain gauge	W. R. Saunders.	Hudson	Rain gauge	
Bryan	do	Francis M. Priest.	Waynesville	do	
Wilmington	do		Ellsworth	do	
Weymouth	do		Salem	do	S. B. Richards.
Cedarville	do		Lordstown	do	B. F. Sowers.
Springboro	do		Alnger	do	Howard S. Friend.
Clintonville	do				

TENNESSEE.

TENNESSEE STATE BOARD OF HEALTH,
METEOROLOGICAL DEPARTMENT,
Nashville, June 1, 1886.

DEAR SIR: I have the honor to acknowledge receipt of your favor of the 27th ultimo. I inclose herewith a copy of the State board of health bulletin for April, containing the report of the State weather service for that month, in which you will find on page 141 a list of the stations and the names of observers who have been reporting regularly and which I hope you will find satisfactory. I inclose also a list of the stations receiving the daily weather indications.

Regarding these latter, I find that the system has been most gladly and gratefully received by the citizens of the vicinity of the stations, and it has certainly proved a most effective way of popularizing the Signal Service in our State, especially in communities where many adverse criticisms had been made regarding its efficiency and benefits. Many of the citizens around these stations wonder how they have done without the signals so long.

I had quite a hard struggle about a year ago to keep the State weather service intact. The commissioner of the bureau of agriculture, having in charge the weather service, concluded to give it up as a useless adjunct to his bureau, and although I used every argument I could to dissuade him, it was a useless task, so I persuaded the officers of the State board of health to take it under their protecting care, agreeing, if they would, to do the work of correspondence and of compiling and tabulating the individual reports each month and making up the general summaries just as the work had been done by me as secretary of the bureau of agriculture. They agreed to take charge of it notwithstanding the very meager appropriation allowed for the health board, and under their charge the State service has become more popular. But before I could take charge of the work I had to promise the commissioner of agriculture that it should not interfere with my work in the bureau; therefore, I have most of the work of compiling, &c., to do at night.

I give you these facts that you may know the struggle for existence our State service has had. My love for the service, and my great interest in it from the first, having organized it, and done all the work to the present time, with but little aid or encouragement, has prompted me to cling to it. I am confident that each year will increase its efficiency and popularity in the State. I will take pleasure in giving you any other information at any time.

Yours, truly,

H. C. BATE,
Secretary Tennessee Weather Service.

Lieut. H. H. C. DUNWOODY, A. S. O., *Washington, D. C.*

Stations receiving daily weather indications.

City.	County.	Remarks.
Johnson City	Washington.	
Loudon	Loudon	East Tennessee.
Athens	McMinn.	
Fayetteville	Lincoln.	
Shelbyville	Bedford.	
Murfreesboro	Rutherford.	
New Middleton	Smith.	
Columbia	Maury	Middle Tennessee.
Nashville.	Davidson	(Central station.)
Springfield	Robertson.	
Gallatin	Sumner.	
Clarksville	Montgomery.	
Lexington	Henderson.	
Jackson	Madison.	
Milan	Gibson	West Tennessee.
Trenton	Gibson.	
Union City	Obion.	
Brownsville	Haywood	Appointed by C. S. O.

In response to my first request for the location of stations to receive the daily indications General Hazen very kindly permitted me to name ten stations. Soon after they were established I had several applications for additional ones, and, at my request, General Hazen permitted me to name six more. So there are sixteen (16) in the State named by me. The station of Brownsville was named by the Chief Signal Officer at the request of the postmaster. I had sent a set of flags down there at the request of one of the citizens, who promised to display them on receipt of the indications each day, but before I

had time to notify the Chief Signal Officer that Brownsville was on my list, my man wrote me that the postmaster had been appointed to display the signals, and sent the flags back to me. I was not sorry, as it gave me the naming of another station, which I did. The system is working admirably, and the people are beginning to swear by the probabilities. I inclose you one of the cards I had printed for distribution.

H. C. BATE,
Secretary Tennessee Weather Service.

List of stations for the month of March, 1886, as reported to the State board of health by voluntary observers in Tennessee, in co-operation with General W. B. Hazen, Chief Signal Officer, U. S. A.

County.	Station.	Observer.
Washington	Jonesboro	Robert L. Mason.
Green	Greenville	Ephraim Link.
Hawkins	Rogersville	S. M. Miller, M. D.
Knox	Knoxville	William O. Bailey.
Blount	Maryville	
Anderson	Andersonville	J. K. P. Wallace.
Campbell	Careyville	David Hart, M. D.
Monroe	Sweetwater	Prof. J. L. Bachman.
Polk	Parkville	J. C. Williamson.
Morgan	Sunbright	
Bradley	Grief	J. T. Cowden.
Bledsoe	Farmingdale	Lewis Boynton.
Hamilton	(a) Chattanooga	Edward A. Beals.
Marion	Fostoria	Charles Foster.
Putnam	Cookville	H. C. Taylor.
Clay	Clementsville	
Warren	McMinnville	
Coffee	Manchester	Wiley Hickerson.
Do	Beech Grove	A. B. Robertson, Jr.
Smith	Riddleton	S. P. Furgusson.
Wilson	Austin	P. B. Calhoun.
Bedford	Flat Creek	
Rutherford	Florence Station	C. F. Vanderford.
Lincoln	Howell	O. R. Hatcher, M. D.
Davidson	Nashville	L. N. Jesunofsky.
Do	Hardison's Mills	
Maury	Hurricane Switch	J. A. Laughlin.
Giles	Pulaski	
Cheatham	Kingston Springs	
Maury	Ashwood	C. F. Williams.
Lewis	Hohenwald	R. Downey.
Dickson	Dickson	Miss Lizzie Reep.
Hickman	Warner	
Montgomery	Sailors' Rest	John Minor.
Wayne	Waynesboro	C. Buchanan, M. D.
Hardin	Savannah	H. R. Hinkle.
Henry	Paris	
Henderson	Lexington	Prof. S. A. Mynders.
Carroll	Huntingdon	A. W. Hawkins, M. D.
Weakly	Dresden	
Gibson	Trenton	A. S. Currey.
Do	Milan	M. D. L. Jordan, M. D.
Hardeman	Boliver	C. H. Anderson.
Dyer	Dyersburg	
Fayette	Somerville	Dortch & Cummins.
Tipton	Covington	James I. Hall.
Shelby	Woodstock	C. W. Graves.
Do	(a) Memphis	D. T. Flannery.

MICHIGAN.

MICHIGAN STATE BOARD OF HEALTH.
Lansing, Mich., June 8, 1886.

DEAR SIR: In reply to your letter of May 27, 1886, I would say that there exists no organization in the State of Michigan under the exact title of "State weather service." In the year 1877 the Michigan State board of health, in order to acquire an accurate knowledge of the climatic condition of the State, for use in connection with knowledge of its sanitary condition, in the study of the public health, instituted a voluntary meteorological service consisting at first of twelve stations. This service has been gradually increased until at present it numbers thirty-seven stations. The observers for this service are of two classes, the one being composed of the officers of the United States Signal

Service Corps who are stationed in this State, and who, by courtesy of the Chief Signal Officer of the United States Army, are permitted to furnish this office monthly with a copy of the record of their meteorological observations; the other class consists of a number of voluntary observers in different parts of the State who, without pecuniary remuneration, have consented to make and forward to this office meteorological observations at their several localities.

The last named class of observers are furnished with instruments, blank forms, and other necessary material for the work by the State board of health. The first named class use the instruments supplied by the United States Signal Service authorities, and are furnished with blank forms and ozone test paper only from this board. The observations taken and transmitted to this office by the above mentioned observers are tri-daily at or near the hours of 7 a. m., 2 p. m., and 9 p. m., local time, and consist of readings of open-air and registering thermometers, psychrometer and barometer, together with a record of the per cent. and kind of cloudiness, force and direction of wind, coloration of ozone test paper, kind and amount of precipitation, and whatever casual phenomena may occur. The instruments supplied to the voluntary observers by this board are manufactured by J. & H. J. Green, of New York City, and the ozone test paper is prepared according to the Schonbein formula by Professor J. H. Long, of Chicago Medical College.

The results of the observations thus made are, when received at this office, compiled, tabulated, and graphically portrayed in diagrams, and so rendered available for the purpose for which they were intended, viz., the facilitation of the study of subjects promotive of the public health, by comparison of meteorological and sanitary conditions, and are published in the annual reports of this board. The following is a complete list of the observers reporting to this office, with the localities from which they report, arranged divisionally with regard to their geographical positions, beginning with the most northerly situated:

Name.	Place of observation.	County.
W. W. Dent*	Marquette	Marquette.
Arthur Beebe	Manistique	Schoolcraft.
L. M. Pindell*	Escanaba	Delta.
G. H. Cleveland, M. D	Pentwater	Oceana.
S. E. Wait	Traverse City	Grand Traverse.
A. W. Nicholson, M. D	Boyne City	Charlevoix.
George M. Chappel*	Mackinaw City	Cheboygan.
James J. Fitzgerald*	Alpena	Alpena.
D. W. Mitchell, M. D	Harrisville	Alcona.
Joseph E. Mueller*	Grand Haven	Ottawa.
John P. Stoddard, M. D	Muskegon	Muskegon.
E. S. Richardson, M. D	Reed City	Osceola.
John J. Granville	East Saginaw	Saginaw.
John W. Kimball	Port Austin	Huron.
William M. Edmonson*	Port Huron	Saint Clair.
John S. Calkins, M. D	Thornville	Lapeer.
Professor R. C. Kedzie	Agricultural College	Ingham.
Professor J. W. Ewing	Ionia	Ionia.
E. H. McCallum	Lansing	Ingham.
G. G. Gordon, M. D	Swartz Creek	Genesee.
Professor M. W. Harrington	Ann Arbor	Washtenaw.
J. H. Kellogg, M. D	Battle Creek	Calhoun.
A. H. Boies	Hudson	Lenawee.
George C. Palmer, M. D	Kalamazoo	Kalamazoo.
W. T. Drake	Marshall	Calhoun.
L. G. North, M. D	Tecumseh	Lenawee.
S. Alexander	Birmingham	Oakland.
N. B. Conger*	Detroit	Wayne.
Milton Chase, M. D	Otsego	Allegan.

* United States Signal Service observers.

I take pleasure in forwarding to you the above statement in regard to the meteorological department of this board, and shall be glad to afford you any further information on the subject you may in future desire.

I may add that this branch of the work, under the direction of the Michigan State board of health, has already yielded valuable data for the study of the causation of two of the most important diseases which cause deaths in Michigan, namely, typhoid fever and pneumonia, it having been shown by means of the data thus collected that the rise and fall of the typhoid fever in Michigan is apparently controlled by the rise and fall of the ground-water, probably for the reason that when the water in wells is low the leachings into it from privy-vaults is least diluted. The causation of pneumonia appears to be in an entirely different manner, not materially influenced by the rainfall, but it is

controlled by the atmospheric temperature and humidity. As soon as its mode of causation is fully understood by the people it is hoped that many lives may be saved, even though such climatic conditions cannot be changed, except in buildings in which, after all, a large part of the time of most people is spent. The studies of the causation of other diseases are in progress.

Very respectfully,

HENRY B. BAKER,
Secretary.

Lieut. H. H. C. DUNWOODY,
Signal Service, United States Army, Washington, D. C.

MISSOURI.

The following is a sample of the monthly bulletin issued by the Missouri State weather service, under the direction of Professor Francis E. Nipher, director; Maurice Johnson, assistant:

MISSOURI WEATHER SERVICE, *July*, 1886.

The past month has been an exceedingly dry one all over the State, except the extreme southern part, where the rainfall was nearly 6 inches at Protem, Taney County, near the border of the State. From here the fall diminished to fractions of an inch in the central and northern parts, and at three stations, viz., Chamois, Kirksville, and Pleasant Hill, no appreciable rain occurred, the report being zero.

The fall at the central station was 0.24 inch, which shows a deficiency of 3.92 inches, the normal for July being 4.16 inches. This is the least amount of rain for the month of July recorded at the central station since 1839. The next smallest July rainfall on record is 0.84 inch for 1846 and 0.92 for 1853.

The mean temperature at the central station was 80°.4, which is 1°.2 above the normal. The highest temperature recorded was 95°.5 on the 29th, and the lowest was 65° on the 15th, 17th, 18th, and 19th.

The mean temperature for the State was 78°.3 for the month, as deduced from the reports of eighteen observers. The same value was obtained for this month in 1885. The highest temperature reported was 106° at Miami, 104° at Protem, and 102° at Sedalia; lowest was 50° at Ironton, 55° at Steelville, and 57° at Houstonia.

The observer at Chamois remarks that "there has not been rain enough this month to wet a cotton handkerchief spread out—the driest month on record. Mean temperature a little over one degree below the normal; while the rainfall is, of course, 2.15 inches below. Corn could not make more than one-third crop if it were to rain now; yet it has not 'fired up' as badly as would be expected from so long a drought."

Lamonte.—Notwithstanding the extreme dryness of the month there is a prospect for something like a half crop of corn. Grapes are being injured by the drought, and gardens are greatly damaged. People are hopeful, however, and have been worse off in past years.

Miami.—Wheat is good; all the grasses fine; corn, two-thirds crop without any more rain; apple crop good. Hog cholera has killed over two-thirds of the hogs.

Lexington.—Late corn almost ruined by drought and pastures nearly worthless.

Houstonia—The close of the month finds the ground hard and dry; corn suffering greatly for rain, and grass dry and short.

Laflin reports the corn very much damaged by drought; but hay the best ever known.

Savannah reports an average crop of corn on new clover ground; but on old ground it is dried up; grass about half crop; a great number of fruit-trees dying, the ground being dried up to a depth of 4 feet.

Oregon reports this July the dryest in thirty-two years. The early corn of the county will make a good crop; late corn is "firing;" fruits are better than usual. Streams are low and pasturage suffering; many farmers are compelled to dig wells for their stock.

The following was sent in by Professor Nipher:

Iowa City, Iowa.—There has been no appreciable rainfall here during July, and the fall has not been over half an inch in all since the middle of May. Wheat, oats, and hay turned out well, the quality being excellent. The corn crop is badly damaged, the late planting being beyond help. It is already in tassel, although only 2 to 3 feet high. The early planting may yield half a crop if rains come soon. This drought extends over a large part of Central and Southern Iowa, although local rains have fallen in some parts of the State.

MAURICE JOHNSON,
Assistant in Charge.

WASHINGTON UNIVERSITY, *August* 9, 1886.

Tabulation of observations.

City.	Observers.	Temperature for month.			Rain-fall.	No. days.	
		Min.	Max.	Mean.		Rain.	T. L.
		°	°	°	*Inches.*		
Cairo, Ill.	C. L. Bozzell	62.0	92.9	78.1	1.01	5	5
Corning	William Kaucher				—		
Centreville	M. McKenzie				—		
Chamois	G. W. Dallas	64.0	99.0	77.4		0	0
Glasgow	T. Berry Smith				—		
Greenfield	S. B. Bowles	66.0	100.0	79.0	4.50	3	3
Harrisonville	George M. Houston				—		
Hannibal	F. W. Gill	63.0	98.0		—		
Houstonia	S. J. Spurgeon	57.0	99.0	78.1	0.06	3	
Ironton	W. H. Delano	50.0	91.0	71.6	1.30	3	2
Keokuk, Iowa	Sergeant Gosewisch	58.0	97.5	77.5	0.65	2	1
Kirksville	Charles Patterson	62.0	101.0	77.9		0	
Laflin	M. L. Cartwright	68.0	87.0		3.00	2	
Leavenworth, Kans.	L. A. Welsh	59.5	100.2	78.4	0.55	2	0
Lexington	J. B. Alexander	62.0	95.5	77.3	0.31	4	3
Louisiana	M. J. Hassler				—		
Lamar	J. W. Dunn				—		
Lamonte	R. A. S. Wade				1.70	3	
Licking	J. T. Morris				—		
Mascoutah, Ill.	Theodore Englemann	61.0	101.5	81.6	0.37	1	1
Mexico	F. J. Llewellyn	64.0	98.0		0.03	2	1
Miami	A. W. Sullivan	58.0	106.0	77.0	0.20	3	
Mound City	Lawrence Kaucher	58.0	101.0	79.1	0.32	4	0
Oregon	Mrs. William Kaucher	61.0	98.0	78.6	0.20	3	
Pleasant Hill	G. C. Broadhead	66.0	97.0			0	
Protem	Silas Turnbo	60.0	104.0	81.6	5.91	9	9
Phelps City	J. S. Wade				—		
Sedalia	C. G. Taylor	61.0	102.0	80.7	0.62	3	1
Steelville	E. A. Pinnell	55.0	98.0		0.20	3	
Springfield	E. M. Shepard				—		
Warrenton	John H. Frick	64.0	98.0	75.5	—		
Saint Louis:							
Central station	Maurice Johnson	65.0	95.5	80.4	0.24	2	0
Signal office	Sergeant Weber	62.7	96.1	80.4	0.50	8	
2929 Olive street	A. W. Meston				—		
Water-works	A. J. Chaphe				0.58	2	
Savannah	R. Van Buskirk	70.0	101.0		0.30	1	1
Saint Charles	J. R. Mudd				0.50	1	0
Shelbina	John S. Chandler				0.01	1	

The sign — in the rainfall column denotes *inappreciable.*

ILLINOIS.

ILLINOIS STATE WEATHER SERVICE, DIRECTOR'S OFFICE,
Springfield, July 29, 1886.

CHIEF SIGNAL OFFICER, *Washington, D. C.*

DEAR SIR: In compliance with your request, I herewith inclose a short sketch of the Illinois weather service.

Hoping that it will meet your requirements, I am yours, truly,

CHARLES F. MILLS, *Director.*

The Illinois State weather service was organized in July, 1877, with thirteen voluntary observers, under the direction of Hon. S. D. Fisher, secretary of the Illinois State Board of Agriculture, who conducted the same until January, 1885.

A signal station was established at Springfield in 1877, and began to report to the State director in February, 1878.

Reports were first received from the station at Cairo in May, 1878, and from Chicago in August, 1879. In January, 1885, the number of regular observers was twenty-two, which number has gradually increased until June, 1886, when reports were received from sixty-one stations, and three of the regular observers failed to get their reports in the hands of the director in time to have them incorporated in the weather review.

Three of the observers have reported to the department ever since its establishment, in 1877; three began reporting in 1878; one in 1879; three in 1881; eight in 1882; two in 1883, and three in 1884. The remaining forty began making observations within the last eighteen months.

The Illinois department of agriculture publishes a monthly weather review of about thirty pages, which contains tables giving all the data collected by the observers, as well as a summary of the same by counties under the head of remarks, and an introduction which gives the most salient points and the phenomena of all kinds for the entire State. A summary of the observations is sent each month to all the newspapers of the county in which the station is situated, and published by them, thus giving every one in the county the benefit of them.

The review also contains a list of the stations in Illinois displaying the weather flags, which list is enlarged monthly as the people of the various towns in the State awake to the advantage of knowing the weather indications each morning. Much interest is felt in this branch of the service, and the efforts of a few enterprising men are making themselves felt over a large area of country. Illinois inaugurated the system of announcing the indications by means of steam whistles, the whistle at the deaf and dumb asylum at Jacksonville being the first one in use. A regular code of steam-whistle signals has been formed and is uniform throughout the State. The plan is found specially useful in agricultural districts, as the farmers can hear the whistle at a much greater distance than they can see the flags.

The Chicago and Alton Railroad Company has entered into the spirit of this work, and delivers the dispatches to all points on their line, where requested, free of charge.

COLORADO.

COLORADO METEOROLOGICAL ASSOCIATION,
Colorado Springs, Colo., June 7, 1886.

Lieut. H. H. C. DUNWOODY, U. S. A.,
Office Chief Signal Officer, Washington:

I have the honor to inclose, in response to your recent invitation, an account of the organization of the Colorado weather service, and the work accomplished during the two months of its active existence to the 1st instant.

May I trouble you to insert, in the fourth line before the end, the initials of Sergeant Notson, of Cheyenne, which are unknown to me?

I would be greatly obliged if you would tell me (unless the information is contained in forthcoming report) what steps must be taken for the distribution of weather indications in Colorado.

I am yours, very respectfully, F. H. LOUD.

The Colorado Meteorological Association was organized at Denver, December 30, 1884, and articles of incorporation were filed in accordance with the law of the State on January 3, 1885.

These articles set forth as the object of the association the following: "Observing, collecting, recording, and publishing the meteorological phenomena, occurrences, and changes within the State of Colorado and all purposes and objects connected with, incident to, or necessary for the effective carrying out of the above purposes."

The articles of incorporation provide for an annual meeting of the association, at which is elected a board of directors to take charge of the work of the association during the coming year. The directors for the first year were: Charles F. Wilson, president; Samuel A. Fisk, M. D., secretary; Prof. Sidney H. Short, of Denver University; Prof. Charles F. Davis, of the Colorado Agricultural College; Prof. Paul H. Hanus, of the University of Colorado; Prof. F. H. Loud, of Colorado College; Charles Denison, M. D.; Edwin S. Nettleton, State engineer, and Sergeant J. J. Gilligan in charge of the United States signal station at Denver. These gentlemen were re-elected at the annual meeting January 8, 1886. At the first meeting for the election of officers Prof. S. H. Short was chosen as director of observations, the duties of that office having been so defined as to embrace the general superintendence of a State weather service. The same gentleman was re-elected to this office a year later, but subsequently resigned, and in March, 1886, the present incumbent was chosen to fill the vacancy.

During the first year of the association, efforts were made to obtain State aid for the maintenance of the service, but these were unsuccessful, and the association remains dependent entirely upon the fees of members and voluntary contributions. Under these circumstances, combined with the fact that the time and attention of all the directors were engrossed with the duties of their several professions, progress has necessarily been slow.

At a meeting of the directors, held March 23, 1886, action was taken for the organization of the State weather service, and it was deemed best to make a beginning by the periodical publication of weather records, drawn from the observations of a few gentlemen, mostly members of the association, who were known to be ready to contribute

their assistance. Accordingly a weekly record for newspaper publication, to be continued through the summer, was commenced April 13, and the first number appeared in the Denver Tribune, Republican, and the Colorado Springs Gazette. A series of monthly bulletins was begun with the number for April. To these publications, and to correspondence relating to the establishment and direction of observing stations, the work of the present director of observations has been confined. The observers who undertook to report observations from the outset of the work at the beginning of April were the following:

Sergt. James J. Gilligan, Denver; Mr. W. H. Powless, Alma; A. Comstock, M. D., Westcliffe; F. H. Lay, M. D., Pueblo; C. B. Underhill, M. D., Salida; F. H. Loud, Colorado Springs; Capt. T. A. Cunningham, U. S. Army (post surgeon), Fort Lewis; Sergt. T. C. Collins, Montrose; Mr. Emery P. Moon, Husted. Of these gentlemen, the first six named are members of the association. During the two months following, to June 1, 1886, the roll of observers was increased by the following names: Prof. Elwood Mead, of the State Agricultural College at Fort Collins, who contributed observations from Dolores, Colo.; W. L. Dorland, M. D., Glenwood Springs; Miss Naomi Yocum, Trinidad; H. H. Seldemridge, who observed at a ranch near Sanborn; I. B. Perkins, M. D., Hugo; and Mr. Ignatius Zeller, Idaho Springs. By the kindness of the Chief Signal Officer, the following observers and stations of the United States service, comprising (with those at Denver and Montrose, already mentioned) all within the limits of Colorado and three in the vicinity, have been directed to aid the association, and have sent full reports of the observations taken since April 1: Sergts. T. H. Brandenburg, West Las Animas; H. Hall, Pike's Peak; J. E. Lanouette, Dodge City, Kans.; W. V. Twaddle, Santa Fé, N. Mex., and D. B. Notson, Cheyenne, Wyo.

Aside from the telegrams of the Associated Press, the weather indications of the central office are at present (June 1) received only by the observers in charge of the United States Signal Service stations.

Respectfully submitted.

F. H. LOUD,
Director of Observations, Colorado College, Colorado Springs, Colo.

NEBRASKA.

Nebraska Weather Service, annual report, 1885.

BOSWELL OBSERVATORY, DOANE COLLEGE, CRETE, NEBRASKA.

At the close of this, the first entire year in which the service has been under the present management, it is fitting that there should be a report upon the work done during the year at the central office. This has been nothing less than the entire overhauling and revision of the reports of observers from the year 1878 down to date, with a view to selecting out what was reliable and discarding what was not. Many of the observers were untrained in the careful methods of the meteorology of to-day. Some did not know how to make averages correctly. Several inquiries have come to this office, *e. g.*, "how to average temperatures when some were below zero;" and it appears that some, not taking the trouble to inform themselves, had treated such temperatures as if they were above zero. Many such mistakes as this have been rectified and many other observations discarded where there seemed reason to doubt their correctness. The entire mass of individual monthly reports, about three thousand in number, have been gone over, doubtful data eliminated, many of their averages recast, and revised averages made from the whole.

Thus it is believed that the statistics for Nebraska weather for the past eight years have been put into reliable and convenient form for future reference and study, and that the tables here given may be depended upon. Any slight discordance between these tables and previously published bulletins is thus explained.

PROGRESS.

There are now thirty-four stations reporting monthly, besides those merely receiving the indications and displaying signals. They cover somewhat thoroughly the southern two-thirds of the eastern half of the State, although some are scattered through the counties of Lincoln, Red Willow, Keith, and Cheyenne in the extreme west. There are three fully equipped stations, viz., the Government stations at Omaha and North Platte and the central office at Crete. Other observers are provided mainly with thermometers and rain-gauges only, though several have barometers and maximum and minimum thermometers.

PLANS FOR THE FUTURE.

The subject to which particular attention will be turned, now that the statistical work has been put upon a good foundation, will be the display of weather signals in various parts of the State. Several stations are now displaying cold-wave flags, and arrangements are now being made with the Chief Signal Officer in Washington by which a daily telegram will be sent to this office, and plans are being perfected for distributing the information to various other points.

REPORT OF OBSERVERS.

The monthly reports, even of observers provided only with thermometers and rains gauges, are somewhat full, as may be seen by the inclosed form of blank used by thi- service.

CROP REPORTS.

Observers, many of them farmers, are asked also to furnish monthly reports of the condition and prospects of crops, fruits, &c., for publication in the monthly bulletin.

WEATHER INDICATIONS.

Besides the central station the following observers receive the daily indications and display signals under the direction of this service: J. B. Parmelee, Nebraska City; Albert Watkins, Lincoln; S. S. Kauffman, Stromsburg; S. L. Brass, Juniata; Thomas Shryock, Louisville; Iaeggi F. Sheepbach, Columbus; C. L. Howell, Grand Island; W. A. Wagner, Beatrice; T. J. Pickett, jr., Ashland; F. L. Wheedon, York.

The following also receive the indications and display signals, though not reporting to this office: W. W. Watson, Fairbury; A. Minnick, Falls City; Kenny & Steward, Blair.

Until debarred by the late decision of the Postmaster-General there were sent out daily on the mails East, South, and West, to all post-offices which could be reached by 6 p. m. (about sixty in number) the special 10 a. m. predictions, a card being used for this purpose.

The following is the present list of observers:

Mean Temperatures.—Crete, C. E. Chadsey; Omaha, A. Pollock; Central City, C. Shieldstream; Dawson, M. L. Libbee; De Soto, Charles Seltz; Falls City, Jennie Keim; Fremont, I. E. Heaton: Harvard, M. F. Wistrom; Lincoln, H. H. Wing; Minden, Joel Hull; Mission Creek, M. K. Walker; Nebraska City, J. B. Parmalee; Ogalalla, Dr. L. M. Line; Sargent, S. W. Perin; Stromsburg, S. S. Kauffman; Syracuse, P. W. Risser; Weeping Water, G. Treat; West Hill, J. L. Truman.

Noon Temperature.—Ashland, George Shedd; Beaver Creek, E. Smith; De Witt, F. C. Ware; Fairbury, Dr. Humphrey; Keene, Addie Le Bar; Marquette, J. Ellis; Neligh, H. C. Huxford; Red Willow, Mrs. R. Buck; Stockham, J. W. Gray; West Point, E. G. Bruner; York, D. P. Nicholson.

Also—North Platte, J. Fitzgerald; Purdum, T. C. Jackson; Hay Springs, William Waterman; Pleasant Hill, Charles Ingles; Hannah Thompson, Mead.

Through the kindness of the Chief Signal Officer the various publications of that office are sent to this office for distribution to the observers. We seek in various ways to interest and inform the observers upon meteorological topics; a convention for this purpose and for considering plans for the future is called to meet at Crete in July, and it is intended to make these gatherings annual.

FINANCES.

This being a volunteer organization the expenses of the central office are borne by Doane College, with which said office is connected; and the instruments are owned by the various observers.

PUBLICATIONS.

A monthly bulletin is published by the central office, and furnished to observers, to chiefs of other weather services, and to the press.

GOODWIN D. SWEZEY,
Director Nebraska Weather Service.

INDIANA.

The following is a synopsis of the monthly bulletin issued by the State weather service of Indiana, under the direction of Prof. H. H. Houston, of Purdue University, Lafayette, Ind.

Monthly Meteorological Summary from Stations of the Indiana Weather Service, for June, 1886.

[From reports received at the State Station, Purdue University, Lafayette, Ind.]

Stations.	Observers.	Notes.	Temperature. Highest.	Temperature. Lowest.	Temperature. Mean.	Rainfall, including melted snow.	Specially heavy. Amount.	Specially heavy. Date.	Dates of hail.	Dates of thunder storms.
Southern counties.			°	°	°	*Ins.*	*Inches.*			
Columbus, Bartholomew	J. A. Perry	a	86.	48.	70.4	5.93	1.34	27		
Marengo, Crawford	J. M. Johnson	a, f	91.	54.	72.3	7.29	2.60	27		2, 13, 14, 15, 20, 24, 25, 27, 29
Blue Lick, Clarke	G. Poindexter	a	85.	52.	70.0	10.08	2.97	27		1, 9, 13, 24, 29
Huntingburgh, Dubois	George P. Moog	a	94.	54.	71.4	7.04	1.72	27		
Brookville, Franklin	A. W. Butler	a	85.	53.	68.5	6.23	1.00	16		
Princeton, Gibson	Elisha Jones	a	94.	55.	71.3	4.90	1.50	13, 27	2	2, 9, 13, 22, 26
Butlerville, Jennings	Joseph Hole	a	90.	52.	71.1	8.51	2.28	15		2, 9, 13, 15, 25, 26
Vevay, Switzerland	C. G. Boerner	a, b	86.	51.	70.6	7.39	2.25	27	2	2, 9, 13, 15, 23, 26
Degonia, Warrick	James P. White	a	88.	58.	71.3	5.81	1.47	14		
Salem, Washington	James W. May	a	84.	56.	71.6	8.92	2.21	13		8, 24, 25
Southern counties			94.	48.	70.9	7.21				
Central counties.										
Frankfort, Clinton	E. H. Staley	a								
Connersville, Fayette	Robert Hessler	a	88.	55.	68.3	5.53	1.02	13	25	8, 13, 23, 25
Worthington	Dr. W. B. Squire	a	86.	53.5	69.6	7.00	2.00	27		2, 9, 13, 16
Noblesville, I	L. M. Wainright									
Greenfield, H	Dr. S. S. Boots	a	90.	55.	69.9	5.63	1.61	13		2
Spiceland, H	William Dawson	a, b	93.	42.	67.5	6.01	2.02	9		
Franklin, Jo	D. A. Owen	a								
Indianapolis,	C. Wappenhans	d, b	89.	46.9	69.2	4.92	1.57	13		2, 13, 17, 24, 25
Greencastle, Putnam	O. Parker	d, b	84.5	48.1	68.5	3.59	1.12	13		2, 9, 13, 14, 15, 22, 24, 26
Farmland, Randolph	W. J. Davisson	a	88.	44.	66.5	3.15	1.47	9		16
Mauzy, Rush	E. Kirkwood	b, e	88.	37.	66.9	3.34	1.41	9	23, 25	2, 9, 13, 15, 23, 25, 26
Knightstown, Rush	D. L. Lughlain	a, b								
Lafayette, Tippecanoe	H. A. Huston	b, h	92	[illegible]	[illegible]	[illegible]	1.06	13		13
Richmond, Wayne	J. M. Gluys	a	[illegible]	[illegible]	[illegible]	[illegible]	1.66	9	25	2, 9, 13, 14, 17, 24, 25
Dana, Vermilion	Frederick Rush	a, f	[illegible]	[illegible]	[illegible]	[illegible]	2.25	14		13, 14, 24
Central counties			[illegible]	[illegible]	[illegible]	[illegible]				
Northern counties.										
Fort Wayne, Allen	W. F. Yocum	a								
Delphi, Carroll	R. L. Higginbotham & Son.	a	[illegible]	[illegible]	[illegible]	[illegible]	.97	13		13, 16, 28
Logansport, Cass	Thomas B. Helm	a	[illegible]	[illegible]	[illegible]	[illegible]	1.75	13		16
Marion, Grant	S. R. Fankboner	i	[illegible]	[illegible]	[illegible]	[illegible]	.80	13, 24		
La Grange, La Grange	R. H. Rerick	a	[illegible]	[illegible]	[illegible]	[illegible]	1.70	15		
Miami, Miami	Isaac Records	a, f								
Monticello, White	W. S. Bushnell	a, g	[illegible]	[illegible]	[illegible]	[illegible]	1.81	13		
Northern counties			[illegible]	[illegible]	[illegible]	[illegible]				
Northern counties			[illegible]	[illegible]	[illegible]	[illegible]				
Central counties			[illegible]	[illegible]	[illegible]	[illegible]				
Southern counties			[illegible]	[illegible]	[illegible]	[illegible]				
State			94.	37.	69.1	6.41				

NOTE.—Frost June 4.

BAROMETER.

	Mean.	Highest.	Date.	Lowest.	Date.	Range.
	Inches.	*Inches.*		*Inches.*		*Inches.*
Vevay	30.003	30.200	3	29.780	16	.420
Spiceland	30.050	30.230	3	29.870	15	.360
Indianapolis	29.951	30.196	3	29.677	16	[illegible]
Greencastle	29.945	30.190	3	29.689	16	.501
Lafayette	30.042	30.260	3	29.791	16	.469
State	30.000	30.260		29.677		.583

Monthly Meteorological Summary, &c.—Continued.

WIND.

	Total miles for the month.	Mean daily velocity.	Mean hourly velocity.	Maximum velocity.	Date.	Prevailing direction.
Indianapolis	3117	103.9	4.3	18 N.W.	17	S.
Greencastle	3227	107.6	4.5	15 N.	16	S.E.
Lafayette	3731	121.4	5.2	19 W.	17	S.W.
Vevay	....	....	....	25 S.W.	25	N.E.

a. Observations at 7 a.m., 2 p.m., and 9 p.m. *b.* Highest and lowest from self-registering instruments. *c.* Observations at 7 a.m., 12.30 and 9 p.m. *d.* From reports of signal officers. *e.* Observations at 7 a.m. and 7 p.m. *f.* Lowest temperature from special observations. *g.* Lowest temperature from self-registering instruments. *h.* Observations at 7 a.m., 1 p.m., and 9 p.m. *i.* Observations at 7 a.m. and 6 p.m.

The mean temperature of the State for June, 1886, was 1.2° below the mean of June for the past four years, 3.0° below the mean of sixteen years at Indianapolis, 4.8° below the mean of thirty-one years at Logansport, 5.0° below the mean of twenty-one years at Vevay, 1.4° below the mean of thirty-two years at Spiceland, 3.0° above the mean of seven years at Mauzy, 2.7° below the mean of nine years at Blue Lick, 3.5° below the mean of four years at Worthington, 0.5° below the mean of four years at Connersville, 0.7° below the mean of seven years at Lafayette, and about 3.4° below the normal temperature for June. The mean temperature at the various stations was below the normal, the amounts ranging from 0.9° to 3.5°.

The mean rainfall for the State was 0.85 inch above the mean of June for the past four years, 0.22 inch below the mean of fifteen years at Indianapolis, 1.48 above the mean of thirty-one years at Logansport, 0.53 above the mean of twenty-years at Vevay, 0.67 above the mean of twenty-eight years at Spiceland, 0.01 below the mean of six years at Mauzy, 0.79 above the mean of four years at Blue Lick, 0.29 above the mean of four years at Worthington, 0.43 above the mean of four years at Connersville, and 0.25 below the mean of seven years at Lafayette. The rainfall has been unequally distributed throughout the State; at most stations it has been in excess of the normal, while at Indianapolis it was 0.71 inches below the normal, and at Lafayette 3.06 inches below. A severe hail-storm did considerable damage near Connersville on the 25th.

Solar halos were reported on the 12th, 15th, and 19th; lunar halos, on the 12th; aurora on the 4th, 5th, and 29th.

The mean barometer was about .02 inch below the normal.

H. A. HUSTON,
Chief State Weather Service.

AMERICAN HORTICULTURAL SOCIETY,
Greencastle, Ind., June 1, 1886.

DEAR SIR: In reply to your request of May 27, for information concerning the "Indiana weather service" of this place (De Pauw University), I would say that our first published monthly summary was for September, 1884, since which we have issued regular bulletins which have been fully distributed throughout our State, and, indeed, to all sections of the country, where they have been highly appreciated by scientists and others, students of meteorology.

Our own organization has no legal status, the State having, thus far, done nothing in support of a bureau of meteorology, although an effort was made during the last general assembly, which came near succeeding, the bill having passed the house of representatives, but so near the close of the session that it was lost in the hurry and rush at the close of the senate. Our work is, therefore, purely voluntary, the whole expense and support of the service being by the De Pauw University, a private institution of learning under the control of the Methodist Episcopal Church.

During the year our service has been very greatly improved and several new stations added, the whole number of co-operating observers now being thirty-seven, from almost as many counties of the State. These reports are summarized in a highly condensed form and published, as noted above, monthly. For convenience, and to more clearly exhibit the gradual change of climate incident to the varying latitude of our State, these reports are arranged in three sections from the northern boundary of the State southward, the means of each section being shown separately, a form of publication which is rapidly gaining popularity with similar services in other States.

Another original feature of our reports is the column of distances, in miles, of the various stations from the northern boundary of the State.

Our reports are also printed on flat sheets, of uniform size, which may be easily and conveniently filed and preserved for reference, each single page being a complete report within itself. A comparison is also shown for each of the stations of long continuation, with the means and extremes of corresponding months for the series of years recorded.

As a measure of still further interest, especially to many who desire from various causes to study the meteorological character of other sections of our country outside the State, we have arranged through the courtesy of the Chief Signal Officer to secure reports from signal stations at distant points, which reports are published in connection with our monthly bulletins. Under the head of "remarks" each bulletin contains, in addition to an editorial leader, on some special topic (usually appropriate to the particular season) of meteorology, which is calculated to stimulate an interest in this science, a general digest of the report, giving prominence to any special features which may not be made sufficiently clear in the tabulated form.

Below I give the name and address of our co-operating observers, with distance in miles from the northern line of the State, arranged from the north southward.

R. H. Perick, La Grange, 9; L. Stealy, Angola, 10; J. A. Varier, North Liberty, 16; N. L. Kithkart, Columbia City, 42; Professor W. F. Yocum, Fort Wayne, 48; Thomas B. Helm, Logansport, 70; W. S. Bushnell, Monticello, 71; I. Records, Miami, 80; R. L. Higginbotham & Son, Delphi, 82; Prof. H. A. Huston, Lafayette, 93; L. W. Cates, Muncie, 108; W. J. Davidson, Farmland, 109; S. D. Symmes, Crawfordsville, 119; William Dawson, Spiceland, 134; J. M. Gluys, Richmond, 135; Dr. S. S. Boots, Greenfield, 137; Sergeant C. F. R. Wappenhans, Indianapolis, 139; R. M. Ragan, Fillmore, 144; Sergeant O. Parker, Greencastle, 147; R. Hessler, Connorsville, 148; E. Kirkwood, Mauzy, 149; Professor D. A. Owen, Franklin, 158; Mrs. L. F. Hager, Terre Haute, 159; D. F. Ferris, Sunman, 175; J. A. Perry, Columbus, 177; J. B. Ward, Guilford, 179; Dr. W. B. Squire, Worthington, 183; J. Hole, Butlerville, 190; E. Wells, Commiskey, 202; C. G. Boerner, Vevay, 209; J. W. May, Salem, 217; G. Poindexter, Blue Lick, 225; J. M. Johnson, Marengo, 233; E. Jones, Princeton, 234; L. C. Loomis, Jeffersonville, 238; G. P. Moog, Huntingburgh, 239; James P. White, Degonia Springs, 256.

As yet no special arrangements have been made for furnishing stations, outside of one in this city, with daily weather indications.

For repeated favors shown this service, it is greatly indebted to Chief Signal Officer General W. B. Hazen, yourself, and others connected with the service at Washington; also to Sergeant O. Parker at this station, and Sergeant Wappenhans at Indianapolis.

Yours, very respectfully,

W. H. RAGAN,
Director Indiana Weather Service.

Lieut. H. H. C. DUNWOODY,
Signal Office, Washington, D. C.

DAKOTA.

TERRITORY OF DAKOTA,
DEPARTMENT OF IMMIGRATION AND STATISTICS,
Huron, June 1, 1886.

DEAR SIR: I have your favor of May 13, with stated inclosures; I beg to assure you of my great interest in the proposed enterprise, and of my desire to be of all possible service to you. I am sure our people will take hold of the matter, and I shall do what I can to bring it to their attention. I would like to be advised whether it is your purpose to furnish all of the stations situated on railroads, including the Deadwood and Fort Totten stations, with these forecasts, and also how great an area is held to be included in "Eastern Dakota," and if other areas are to be similarly supplied with these daily forecasts. Please inform me fully on this head. I shall be as active as I can in extending the co-operation and assistance of this office. I think the great benefit to our farmers, particularly, will be fully appreciated by our railroad companies, and they will very generally provide for the transmission of dispatches over their own telegraph lines. As soon as I know definitely as to the purpose of your office as to the above, I will be glad to call the attention of the railroad companies to the matter and invite their aid. I should like to receive your suggestions and advice with respect to making every possible effort I can to render the above undertaking a success.

Yours, very respectfully,

LAUREN DUNLAP.

Lieut. H. H. C. DUNWOODY,
Acting Assistant Chief Signal Officer, Washington, D. C.

TERRITORY OF DAKOTA,
DEPARTMENT OF IMMIGRATION AND STATISTICS,
Huron, June 23, 1886.

DEAR SIR: I have yours of May 27th, only now received on my return from the East, the letter not having been forwarded to me, through a mischance, consequently I am unable to forward the report in time for your use on July 1.

The "Dakota Weather Service" was only established in August last, and is yet in its infancy. Little has been done, except to publish the summary obtained through the reports of the United States Signal-Service stations at Yankton, Deadwood, Huron, Fort Sully, Bismarck, Fort Buford, Fort Totten, Moorhead, and Saint Vincent, furnished this office by order of the Chief Signal Officer.

I have endeavored to supplement the tables used with a text that might be read and serve to interest people generally in the subject of the weather, and the importance and value of the Signal Service. I think some progress in this direction has been made, and I believe that with a little effort the daily forecasts of weather now furnished through the Huron station, may be made very useful, and become popular for that reason, as indicated in my letter of June 1, your reply to which I am awaiting with interest, that I may be of what service I can to you in this highly important enterprise.

Yours, very respectfully,

LAUREN DUNLAP.

Lieut. H. H. C. DUNWOODY,
Acting and Assistant Chief Signal Officer, Washington, D. C.

GEORGIA.

STATE OF GEORGIA,
DEPARTMENT OF AGRICULTURE, *Atlanta, May* 31, 1886.

DEAR SIR: In reply to yours of the 27th, I beg to submit the following history of the Georgia State weather service:

Observations were instituted in February, 1876, at Atlanta station, by Prof. P. H. Mell, Jr., under the direction of Hon. Thomas P. Janes, commissioner of agriculture. Professor Mell was succeeded as observer in 1877 by R. J. Redding, then clerk of the state department, now assistant commissioner, and have been continued by him to date. A few out-lying stations were reported during the years 1877 and 1878, and in April, 1878, a regular corps of observers was organized, covering all parts of the State. The territory was divided into five sections, as appears by reference to the accompanying map. In the fifth annual report of my predecessor, Hon. Thomas P. Janes (of which I send you a marked copy), he gives a short account of the establishment of the service, and in Circular No. 62 appears the first annual "summary," embracing from April to December of that year. The paragraph in the report referred to states the prime object of the work thus undertaken, and that the same has been accomplished, and the results given to the public in the recent publication of this department, entitled "The Commonwealth of Georgia," of which you probably have a copy (I sent one to General Hazen). The little map inclosed herewith is one of a series of maps that illustrate the work.

The service has been continuously kept up since its first organization, though with many changes in observers, and a gradual reduction of the whole number. Circular No. 74 shows the organization for 1885. If you have not access to the copy of the "Commonwealth of Georgia" alluded to, I will on notice send you a copy for your own use.

I have no official means of knowing whether any of my observers are furnished with the weather indications. They are not furnished through this office.

Very truly,

J. T. HENDERSON,
Commissioner.

Lieut. H. H. C. DUNWOODY,
Office Chief Signal Officer, Washington, D. C.

Meteorological Stations of the Georgia State Weather Service.

As indicated in the last annual report, a system of meteorological observations has been inaugurated, embracing the entire State; and for this purpose forty-nine stations have been established, as follows: In North Georgia—Blairsville, Canton, Dahlonega, Dalton, Dillon, Gainesville, Leo, Mount Airy, Rabun Gap, Rome, and Trenton—11; in Middle Georgia—Athens, Atlanta, Carrollton, Elberton, Greensboro, Greenville, Griffin, La Grange, Macon, Milledgeville, Oxford, Talbotton, and Thomson—13; in Southwest Georgia—Albany, Americus, Bainbridge, Butler, Columbus, Cuthbert, Nashville, Quitman, Thomasville—9; in East Georgia—Augusta, Dublin, Hawkinsville, Louisville, McRae, Ogeechee, Sandersville, Swainsboro, Waynesboro, and Walthourville—10; in Southeast Georgia—Baxley, Blackshear, Brunswick, Dupont, Savannah, and Saint Mary's—6; total, 49 stations.

Each observer is supplied with a thermometer and rain-gauge, all of uniform pattern, and made to order for the use of the department. Observations on the thermometer are made at stated hours, three times daily, in accordance with the system first devised by the Smithsonian Institution; the rainfall, the direction of the wind, and the weather are also noted, together with general remarks on the condition of growing crops as affected by meteorological conditions.

These observations are all entered in a record book (also especially prepared for the purpose), and monthly transcripts of the same sent to the department. These monthly reports are consolidated and a general summary of the same published in the current crop reports. At the end of each year it is proposed to consolidate the monthly reports and enter them in a book to be prepared for the purpose. The original reports will be bound in one volume, and filed for future reference.

These observations will be useful in ascertaining accurately and absolutely the climatic features of the State, their diversity in the different sections, and the comparative mildness of the climate of all. They will become more and more valuable as the period of time covered by them is lengthened and the mean results become more accurate and reliable. Meteorological observations also reveal the peculiar conjunction of circumstances of rainfall and temperature, and their monthly distribution which are found to exist in connection with successful tillage of certain crops, &c.

The most immediate practical benefit, however, to be expected from these observations is in the information afforded to those who contemplate immigrating to this State. Many of these have very erroneous ideas of our climate, based as they are solely on the knowledge of the latitude of the State with reference to the prevailing climates in similar latitudes elsewhere.

KANSAS.

WELLINGTON, KANS., *June* 7, 1886.

SIR: In answer to your request—communication dated Signal Office, Washington, D. C., May 27, 1886—I have the honor to respectfully submit to you the following report, relative to the operations of the Kansas State Weather Service, as conducted by the aid of the co-operating observers located in different parts of the State, as seen in the appended list.

The Kansas weather service, under the present arrangement and operation is, however, quite limited in extent; its first inception dating from the beginning of 1885, when the writer addressed a circular to some fifteen observers located in the State, who were keeping open records of the weather. The object of the circular was to request these observers to forward to us a monthly report of the local weather, &c.; all of which were compiled and published at the close of each month in a paper called the "Kansas Weather Observer," a copy of which was furnished free to each contributing observer.

The facilities for publishing these observations are quite inadequate to the demand, as we find that each observer's individual work is worthy of preservation for its value as a local climatological record.

The neglect of our State officials to provide for the equipment and proper maintenance of a service of this kind, is not in keeping with the advances made by the State in the development of agricultural and educational institutions. We should bear in mind and strive to emulate the example set us by several other States, in making liberal provision for carrying on such work as this.

We have now within the State about thirty-eight observers, nearly all of whom are efficient and competent to furnish complete weather reports. The following is a list of observers who have been furnishing monthly reports for publication in "Kansas Weather Observer:"

Place.	County.	Observers.
Allison	Decatur	J. J. Cass.
Westmoreland	Pottawatomie	Dr. J. Walters.
Leavenworth	Leavenworth	L. A. Welsh (Sergeant, Signal Corps, U. S. A).
Salina	Salina	J. H. Gibson.
Lawrence	Douglas (Lawrence University)	Prof. F. H. Snow.
Wyandotte	Wyandotte	E. R. Heath, M. D.
Sherlock	Finney	J. W. Gregory.
Dodge City	Ford	J. E. Lanouette (Sergeant, Signal Corps, U. S. A).
Ninnescah	Kingman	E. Shaw.
Wellington	Sumner	J. H. Wolfe.
El Dorado	Butler	H. C. Ford.
Emporia	Lyon (State Normal Academy)	Prof. T. H. Dinsmore.
Yates Centre	Woodson	F. R. Gray.
Fort Scott	Bourbon	E. Watson.
Independence	Montgomery	J. M. Altaffer.

In illustration of the character of the work I append herewith notes taken from "Kansas Weather Observer" for April, 1886.

Reports for the month were received from eleven stations. The mean temperature for the entire month, as deduced from these observations, was 53°.4, which is about 1°.5 below the normal for April. The maximum temperature, 75°, was from the 18th to 23d; the maximum range, from 11° to 23°, on the 4th and 6th, reaching the lowest over the northeast portion of the State.

The greatest precipitation in the State covered the area over the north tier of counties, and a semi-circular area from southwest of Leavenworth to El Doradó; then southeast to Independence; this area averages from three to five inches, while over all other portions of the State the average was slightly more than one inch. The average for the State as a whole was three inches, which was about the normal rainfall for April.

High or violent winds were quite below the usual average. Characterizing the month as being generally calm, or otherwise, denoting the absence of any dangerous storms.

Telegraphic reports were ordered for Wellington cold-wave station since October 1, 1885; all dispatches were promptly attended to during the following winter. There is scarcely an industry but what has been greatly benefited by these cold-wave signals.

Yours truly,

JOHN H. WOLFE.

The CHIEF SIGNAL OFFICER, U. S. A.

CONFERENCE OF STATE SERVICES.

Report on the Conference of State Weather Services, held at Washington, D. C., February 24 and 25, 1886.

It having seemed advisable to call together the directors of the various State Weather Services for mutual conference and discussion, the following letter was prepared and sent on November 23, 1885:

SIGNAL OFFICE, WAR DEPARTMENT,
Washington City, November 23, 1885.

SIR: It has been suggested that a meeting of the chiefs of the local State Weather Services at some convenient time during the coming winter would result in much good to the general service, and also assure a greater uniformity in the methods of making observations and reports and the display of weather signals.

I am desirous of aiding the local State organizations, thereby increasing their usefulness, and would be pleased to meet you in this city, where matters of general interest could be discussed, which would prove advantageous to all concerned.

Please favor me with your views on the subject, and if the proposition meets with general favor I will issue a circular announcing that such a meeting will be held, fixing a date which will be most convenient to those interested.

To ——— ———

A sufficient number of replies commending the purpose of such a conference, having been received, the following circular letter was prepared and sent to all interested:

SIGNAL OFFICE, WAR DEPARTMENT.
Washington City, February 2, 1886.

SIR: You are respectfully invited to attend a meeting of the chiefs of State weather services, members of meteorological societies, and others specially interested in the meteorological work of State or local organizations, to be held in the lecture-hall of the Smithsonian Institution on Wednesday and Thursday, February 24 and 25.

A general discussion of the various subjects which may be suggested at this convention will doubtless result in uniform methods of observing and recording observations, and it is also believed that by a general interchange of views on the subject of Signal Service reports and special weather forecasts, these reports may be made more valuable to your section through improved methods of distribution which may be, suggested in this discussion.

I am, very respectfully, your obedient servant,

W. B. HAZEN,
Brig. and Bvt. Maj. Gen'l, Chief Signal Officer, U. S. Army.

In response to this call a large number of persons specially interested in this work assembled at the conference in Washington City on February 24 and 25, 1886.

The following is a list of topics that were suggested as suitable for discussion before the conference:

Suggested topics for discussion at the conference of officers of State weather services, members of meteorological societies, and others especially interested in the meteorological work of State or local organizations, held at Washington on Wednesday and Thursday, February 24 and 25, 1886.

1. Subjects and times for observation, with object of increasing uniformity in work.
2. Location of instruments, especially of rain-gauges.
3. Form of publication of results.
4. Forms of weather signals.
5. Scale for estimating wind velocities.
6. Possibility of term-day observations, as suggested in American Meteorological Journal, page 155, 1884.
7. Increase of thunder-storm observations.

Other subjects as suggested by members of the conference will be considered during the meeting.

W. B. HAZEN,
Brig. and Bvt. Maj. Gen'l, Chief Signal Officer, U. S. Army.

The following is an abstract of the minutes of the sessions of the conference, containing a brief resumé of the subjects discussed and the action recommended:

Present: General Hazen, Professors Mendenhall, Payne, Mell, Upton, Thomas, Fuertes, Davis, Marvin, and Russell; Lieutenant Dunwoody, Messrs. Henderson, Redding, Rotch, Gillingham, Ellsworth, and Noyes.

The meeting was opened by General Hazen, Chief Signal Officer, at 10.30 a. m. February 24.

Prof. T. C. Mendenhall was chosen chairman and Prof. W. M. Davis, secretary.

Professor Mell moved that the printed list of topics for discussion form the order of business for the meeting. Carried.

Professor Upton moved that any additional subjects for discussion be given to the chairman in writing. Carried.

After discussion by Messrs. Upton, Payne, Russell, and Thomas, it was voted that the conference recommends volunteer observers to read their maximum and minimum thermometers at the latest observation of the day, preferably at 9 p. m. The hours for regular thermometric observations were discussed by Messrs. Davis, Mell, Upton, Thomas, and others, and on the suggestion that error might arise by replacing local with standard time, the question was postponed until the afternoon session for further consideration.

Lieutenant Dunwoody asked for suggestions concerning record Forms 122 B, C, D, E, of the Signal Service. After discussion by Messrs. Mell and Redding, Messrs. Dunwoody, Mell, and Upton were appointed a committee to report on these forms, and on a record-book for the observers' property, at the last session of the conference.

Adjournment at 12.15 to meet at 1.30.

SECOND SESSION.

Present: Fuertes, Rotch, Thomas, Dunwoody, Russell, Ferrel, Marvin, Mendenhall, Upton, H. A. Hazen, Redding, Payne, Mell, Davis, and Noyes.

Meeting called to order by the chairman at 1.45.

Professor Upton reported that the mean monthly temperature determined by observations at 7 a. m., 2 p. m., and 9 p. m. would not differ by more than 0°, 2°, F. from those at 6.30 a. m., 1.30 p. m., and 8.30 p. m.

Voted, that the conference recommends volunteer observers to make their regular tri-daily observations of temperatures at 7 a. m., 2 p. m., and 9 p. m., local time, or by the standard time of their meridian.

The location of rain-gauges was then discussed by a number of members, but no action taken.

The cost of gauges and the measurement of snow was then discussed without any recommendation.

The location and exposure of thermometers was next considered. Messrs. Mell and Redding reported that the temperatures reported by "cotton-belt" observers were generally too high. Professor Mendenhall recognized the error and hoped to see it corrected.

At the suggestion of Lieutenant Dunwoody the time of the conference was given to Mr. Isaac P. Noyes to read a paper on "Improvement of the weather service."

The question of weather signals awakened a considerable discussion. Messrs. Davis, Thomas, Mell, Dunwoody, and Woodruff were appointed a committee on weather signals to report progress at the last session and further to consider the matter.

Adjournment to meet at 10 a. m. February 25.

THIRD SESSION.

Meeting called to order at 10.30 a. m., February 25.

Present: Messrs. Mendenhall, Mell, Fuertes, McAdie, Thomas, Marvin, Rotch, Gillingham, Huston, Payne, Upton, Dunwoody, Woodruff, Redding, Hazen, Craig, Ellsworth, and Capen.

After reading minutes of the previous session, the question of the form and location of rain-gauges was again considered.

Voted, after detailed discussion, the conference recommends that, when practicable, rain-gauges be placed with the collecting edge one foot above the ground, and that it stand at least twice as far from adjacent objects, such as trees, buildings, fences, &c., as the heights of those objects.

The conference disapproves roof exposure.

The conference recommends that the new form of Signal Service gauges be taken as a standard and that all observers be requested to conform as nearly as possible to this pattern.

No action was taken on hours of measuring rain or scale for wind velocity.

On motion, the reports of committees prepared for last session were read. (Report of progress of committee on signals is hereto appended.) Adjourned at noon to 1.30 p. m.

FOURTH SESSION.

Meeting called to order at 1.45 p. m.

Present: Messrs. Mendenhall, Davis, Mell, Fuertes, McAdie, Marvin, Rotch, Gillingham, Thomas, Abbe, Upton, Dunwoody, Payne, Russell, Woodruff, Huston, Finley, Walshe, Ferrel, Day, Hazen, Noyes, Nichols, Capen.

The plan of appointing special term-days was explained by Mr. Davis, and, after brief discussión, Lieutenant Dunwoody thought it could be carried out by special arrangements with Signal Service.

The observation of thunder-storms was described by Messrs. H. A. Hazen and Davis.

Organization of State services and forms of publication were considered, but no action was taken.

Report of committee on weather signals was accepted, and its recommendations (2) adopted, and the committee was "continued till discharged."

Messrs. Mendenhall, Fuertes, Dunwoody, Upton, and Payne were appointed a committee to consider plans for the permanent organization of this conference, and to report thereon at a future meeting.

The committee on weather signals was instructed to report to the Chief Signal Officer on the result of its investigations and on the recommendations that it finally has to make.

Lieutenant Dunwoody explained, in answer to inquiry, that volunteer observers are now generally requested to report to local weather services, if existing in their State.

The secretary was instructed to prepare an abstract of the proceedings of the conference for publication in the American Meteorological Journal and in Science, and to tender the thanks of the conference to the Director of the National Museum for his courtesy in providing a place of meeting.

Adjournment at 4.5 p. m., to meet again at the call of the committee on permanent organization.

W. M. DAVIS, *Secretary.*

COMMITTEE ON WEATHER SIGNALS—REPORT.

That the elements of weather signals to be indicated by signals should be: 1, fair or clear; 2, local rains; 3, general rains; 4, 5, 6, higher, stationary, lower temperature; 7, cold wave; and that these should be defined by Indications Board of Signal Service.

"Followed by" can be represented if needed; but it is the sense of the committee that the morning flags should indicate the weather for afternoon and evening; and noon flags should indicate the weather for the next forenoon. The signals should combine the qualities of visibility, cheapness, and simplicity; they should be adaptable to the various forms of display, as on poles, street ropes, railroads, and should be open to extension by addition. In order that so good a color as red should not be lost, it is recommended that red and orange be equivalent, the former for general display, the latter for railroads.

It is recommended that the Chief Signal Officer be requested to undertake experiments that shall determine the relative visibility of colors and different patterns of signals, especially as regards the pattern flags of the Ohio system, the solid colors of the Alabama system, and the proposed drum and cone system; and that he be further requested to send out a circular letter to the several services using weather signals, asking for information regarding the signals in use and for criticism and suggestions in regard to them.

The committee feeling that any system now recommended should be one for permanent use, desires to proceed slowly in its action and to collect evidence as fully as possible before coming to any decision.

It is probable that several months may be needed for this purpose.

W. M. DAVIS, *Chairman.*

At the first session of February 24 no stenographer was present, but the action taken has already been given in the abstract of the minutes.

The following is a detailed statement of the discussions held at the last three sessions:

At the second session, Wednesday afternoon, the second topic of discussion, "Location of instruments, especially of rain-gauges," was considered.

Professor Upton, Rhode Island, thought the first thing to know is what rule is adopted by the different services in the location of their rain-gauges. It is the custom of the observers of the New England service to place the gauge on the ground, and not on the roofs of buildings, the rim of the gauge being one foot above the ground. The reason for adopting this rule is to accord with the custom in certain European countries. It is the custom in England to have the top of the rain-gauge one foot above the ground. He did not make any recommendation, and would like to have the subject discussed. He thought roof exposures of rain-gauges unreliable, due mainly to air-currents.

Professor Payne, Minnesota, said the custom of his service was essentially the same as in New England, the gauge being located one foot above the ground and in localities free from trees and buildings. Later, when the Signal Service officer took charge of the disposition of the gauges, they were placed from 18 inches to 2 feet above the ground. None are exposed upon roofs.

Mr. Redding, Georgia, said the only rule in his State is to place them on the ground. They are using gauges according to a model of his own, and perhaps a little different from those furnished by the Smithsonian Institution, but very similar to those used by the Signal Service. He thought there was very little difference in the amount of rainfall obtained in gauges on elevated places and on the surface of the ground. There might be errors in a given length of time. Rainfall in a gauge exposed on the roof at one time might give a little more than due measurement of the gauge located on the ground, or *vice versa*, but in the course of a year he thought the errors would correct themselves. He is careful to have no trees or buildings near the location of the gauge.

P. H. Mell, Alabama, stated that he was using the Signal Service rain-gauge, and that he had them made at the central station. He gives his observers orders to expose the rain-gauges on the ground. His gauges are placed away from trees and buildings.

Mr. Thomas, Ohio, said his gauges were located in very flat places, and not on buildings at all, and thought the elevation about 18 inches, the lower end of the gauge being placed in the ground. The gauges themselves are procured from the makers of the Signal Service instruments, the gauge being the standard.

Lieutenant Dunwoody said if the Signal Service had a perfect description of the form and dimensions of gauge to be used in the several services they might be enabled to have the gauges made at less cost than if made for individuals. The gentleman from Georgia, he believed, had designed his own gauge, and they cost him 25 cents. He would like to have him give a description of the gauge.

Mr. Redding said the price is 25 cents apiece by the dozen; the measuring scale costs 85 cents additional. The cylinder is made of tin, 14 inches long, 2 inches interior measurement; copper funnel, 4 inches in diameter on top, with cap fitting inward; the diameter of each is exactly 4 inches. The measuring scale is made of box-wood and is 16 inches long, and does not differ materially from that furnished by the Signal Service.

Mr. Upton said when the New England service was first organized, an investigation of the subject of rain-gauges was made, and they concluded that sufficient accuracy had not been attained in the gauge itself; most of them were only approximate gauges; often those furnished by the Signal Service had large errors. The gauge in Providence had an error of 10 per cent. Perhaps the gauges were not made according to pattern. The great difficulty with the rain-gauge, as commonly constructed, is that the rim of the receiver is not perfectly true, and the only way to make the receiver perfectly circular was to turn it in a lathe. The gauges they made were of copper, and they have two kinds in use, both modeled after the style of the Signal Service gauge. One style has the measuring tube attached to the receiver, and in the other the tube is separate. The lowest cost of these gauges, made of copper, is $4.25. We have instructed our observers using gauges of a different style to make tests of their accuracy.

Mr. Hazen thought it ought to be remembered that the error of a gauge due to its exposure was far greater than any possible error that can come from the gauge itself. He thought the cost of the gauge an important matter, as many observers may refuse to take observations because they would have to pay such large prices for the gauges. He thought gauges made of galvanized iron would give accurate results, and also if made of tin the rim might be turned and a sharp, well-defined edge, and one likely to last, would be secured. Such a gauge might be made for 75 cents, although one costing, perhaps, $1 would be more satisfactory. He saw no reason why a tin gauge could not be made within 4 per cent. of accuracy.

Mr. Mell was of opinion that if the edges of the rim of receiver were flared out instead of turned, very little error would be caused; have the diameter of receiver 8 inches and you could have a tin gauge as accurate as one made of copper or galvanized iron.

Mr. Russell stated that the rain-gauge in use in the Signal Service, and which had been in use nearly a year, corresponded with the Upton gauge. The rim of this gauge is made of heavy brass, turned down to a sharp edge; the collecting tube being of drawn brass. These gauges were carefully calibrated and correction cards were sent out with each instrument. He thought cedar the best wood for making the measuring stick, it makes a clean sharp line when dipped in water. The cost of these gauges to the service is $3.30. The sticks cost 10 cents. These gauges are made by a firm in Newark, N. J. In the matter of anemometers, we have succeeded in getting very good instruments for $18, formerly costing $25. The manufacturers will sell to the State services for the same figures.

Mr. Rotch inquired whether snow-gauges were used at all in measuring snow by the different services.

This question developed a difference of opinion in regard to the proper mode of measuring snowfall, some members being of opinion that the best plan was to measure the snow melted, while others thought better results could be obtained by measuring the snow unmelted, with a graduated stick, and estimating the depth if melted, on a scale of 1 to 10.

Mr. Upton thought that the measurement of snow in the northern districts quite difficult, and that a separate column should be added to the form used by observers for reporting precipitation, and that rainfall and snowfall should not be combined as in the present form.

At this point the discussion of rain-gauges was laid over temporarily, and the question of location of instruments was taken up.

Mr. Upton thought that the instrument which was most difficult to locate was the thermometer. He thought there was no difficulty, as a rule, with other instruments, and would like to know how thermometers are exposed in the different services at present.

Mr. Thomas said the exposure of thermometers in the Ohio service is generally in the Signal Service shelters. There is want of uniformity, however, of surroundings. He thought this point was brought out very strongly during the last cold wave. The minimum thermometer at the Signal Service station at Columbus registered on one night minus 2°; at the university, one of the Signal Service instruments located on the east side of a house, not far from the base of a furnace chimney, registered minus 12°. The minimum thermometer at the Signal Service station at the university, exposed in the Signal Service screen, registered minus 14°. Now this fact of difference could not be due to any temperature gradient. The explanation is found in the fact that the Signal Service station lies in the center of the business portion of the city of Columbus, the screen is on the top of the building but little higher than the roofs immediately surrounding, in the track of gases coming from several smoke-stacks lying in the west and southwest, and the prevailing winds there are south and southwest. Further, not only are the thermometers strongly influenced by their position at this station, but the anemometers likewise. Take the velocity and direction of the wind as shown by the reports of the weather bureau, and you will find in our monthly summaries that when you come to compare the temperature and wind movement, there is great discrepancy between the two stations, only a half mile apart. One discrepancy in the direction of the wind is due to a fault at the university itself, owing to the location of the instrument. With respect to the wind movement the error is at the central station, for I have here now the December report of the Signal Service bureau; the record at the Signal Service station is 5,557 miles, and at the university 6,572 miles. The difference is not due to any difference in reading or care of the instruments, but is simply due to the elevations. The anemometer at the University is located on the top of a tower, 100 feet from the surface of the ground. The anemometer at the signal station is placed at much lower elevation, and the wind currents are broken by the surrounding buildings before reaching the instruments.

Mr. Hazen said that in Professional Papers No. 18 will be found a very complete discussion of the observations at the signal office in Columbus, and at the Ohio State University. The difference in the elevations of thermometers is one of the important features. The thermometer at the university being 4 feet above the ground, and that at the signal office in the city being 80 feet. In clear weather the temperatures at the Ohio State University were three or four degrees lower than in the city, but in cloudy weather the city temperatures were lower than in the country. The trouble was not so much with the observations in the city, as there was no interference of air-currents, but with the temperatures at the university being taken only 4 feet above the ground, and consequently being affected by the cooling of the air from radiation from the grass.

Mr. Payne supposed that to get the true temperature, the surface temperature is the one to know. His rule was to expose the thermometer 15 feet above the surface of the ground, and in general not less than 12 feet.

Mr. Mell, referring to the location of the Signal-Service instruments at the cotton-region stations, stated that he had visited last year these stations located in Alabama and found that often where the observers were careful to expose their instruments in accordance with instructions—that is, on the north side of the station buildings—the observations were defective, and many errors arose on account of the proximity of box-cars and locomotives, giving out great heat. At Birmingham, Ala., he found the shelter placed on the north side of the building, but down between several railroad tracks, in the angle of three railroads, and at no time during the day were those tracks clear of cars, and the heat there during the day was much greater than at other points in the city. Very little value is placed upon observations at Birmingham for these reasons. The exposures are usually proper, and care is taken by the observers to carry out instructions, but it is utterly impossible to get accurate results from these instruments placed in the hands of railroad men. It would be best to let other persons take the observations—farmers, &c. He found, in some instances, thermometers placed 50 or 60 feet above the ground, and

placed upon the roofs of railroad buildings. At the Polytechnic Institute the instruments are exposed in a shelter located in his yard, and detached from the building, away from all radiation, and in such a position as not to allow the wind to strike the instruments at all. He gets good average results. The instruments are placed within 8 feet of the surface of the ground. He has been reading them in this position for several years, and he gets very good results.

Mr. Redding, Georgia, said that in regard to the observations at the cotton-region stations, at the time he took charge of the State weather service, he took occasion to examine some of the stations in Georgia, and the location of the instruments, and he found things just as Mr. Mell had stated, that the exposures were very poor on account of the proximity of railroad cars. He did not rely upon the observations at all, the maximum temperatures usually being too high.

The chairman thought all this information relative to the cotton-region stations was just what the Signal Service wanted. But he thought a little explanation was due the conference regarding these particular observers. The observers are paid out of a limited appropriation at the rate of fifteen or twenty cents per day. They are necessarily located at telegraph stations, in order that they may telegraph results to the centers, so that the observations may be telegraphed to the central office in Washington and be made useful. We have now before Congress the estimates for the coming fiscal year, in which we have made an entirely new basis for this cotton-belt service, and have arranged to pay fifty cents per day to each observer in order that we may get intelligent men for this purpose.

Mr. Mell recognized the importance of having these stations at the telegraph offices and fully appreciated the difficulties in the way of having them elsewhere. He thought the difficulty could be surmounted by getting some person away from the railroad to take the observations and carry them to the telegraph office. He thought ladies, young men, and clerks could be found who would be willing to do this. If this could be done, the cotton-belt work would be very highly appreciated by the people of the South. These observations are very necessary for the shipping of cotton. He knew a case where one observer had reported no rainfall for one month, when they had had during that time a good rainfall over the entire State. At Salem the rain-gauge is exposed between two side-tracks, and these two tracks are nearly always occupied by cars, and there is only space enough between the cars sufficient for one man to walk. He debated the question with this observer, and the observer stated that he had authority to place the gauge there by the Signal Service. He succeeded, however, in getting the observer to change the location of the gauge. The men read over the instructions very closely, but do not always place their instruments in the correct locations.

Mr. Hazen said, referring to location of shelters, that ordinarily on the north side of a building the maximum temperature will be lower than the true temperature, but it depends a great deal upon the observer and the way he follows his instructions. In Houston, Tex., it was found that the shelter had been placed upon the south side of the station. If it is not possible to place the shelter on the north side of the building, it should be located on the northeast rather than on the northwest.

Mr. Fuertes inquired as to evaporation gauges; whether evaporation gauges are used in the different State services, and if so, what kind of gauges are used and what are the exposures, or whether measures are taken to determine evaporation at all.

Lieutenant Dunwoody said the Signal Service had exposed a small self-recording evaporating gauge on the roof of the Signal Office in Washington, and he remembered that on a number of days during the summer the record of evaporation was about one-third inch per day. That was his impression. The curve of evaporation was very marked after 12 o'clock in the day, before that time the curve was almost horizontal. There was very little evaporation before noon, but during the latter part of the day the evaporation was very rapid.

Mr. Fuertes was of opinion that the amount of evaporation varies greatly with exposure. Evaporation is such an important element in agriculture that he thought something more ought to be done than had been done hitherto. It will be found that the percentage or difference between evaporation on the shores of marshes, in grass or in low lands, and on the tops of houses and buildings varies a great deal. The question seemed to him one of great importance and something should be done to give an impetus to the use of evaporation gauges; also to secure some uniform method of taking observations.

Lieutenant Dunwoody thought Professor Abbe had some interesting data on the subject, and he was sorry that he was not present.

Mr. Mell suggested that the consideration of the topic under discussion be postponed for the present, and that probably the conference could hear Professor Abbe when it was resumed.

There being no objection it was so decided, and the consideration of the second topic, "Location of instruments," &c., was laid over, and the discussion of the third topic, "Form of publication of results," was taken up.

Mr. Payne suggested that inasmuch as the report of the committee on blank forms for records was not ready, that the subject be deferred until the report was received, and made a motion to that effect, which was carried, and the question was laid over accordingly.

The fourth topic, "Forms of weather signals," was the next subject in order, and the chairman inquired whether it was the desire of the conference to take it up.

Lieutenant Dunwoody said that there was a gentleman present who had prepared an article on the subject of weather maps, and General Hazen had requested him to bring the subject to the attention of the convention, and he moved that an opportunity be given the gentleman (Mr. Noyes) to read his paper to the convention.

The motion was carried, and Mr. Noyes read the following paper:

THE IMPROVEMENT OF OUR WEATHER SERVICE.

When our weather service was first established we had little knowledge of what was wanted. It was a new departure; it was the launching of our bark on an unknown sea.

We had no precedent to guide us. Prior to the date of the weather map the world thought it knew something about meteorology, but the map has taught us that we knew very little about this department of science; and so little was that knowledge that in a scale of ten it would not rank higher than three.

Those who have ignored that wonderful modern acquisition to science may doubt this statement, but let them turn to the old works on meteorology and see the reasons given for rain. See the pretensions of and faith in the almanac-makers in regard to the effect of the moon, the tides, &c.

Before the age of the weather map we knew nothing of the movements of the atmosphere, and all sorts of absurd notions were held in regard to it; and to-day, no matter how intelligent the person may be, if he is ignorant of the weather map he is ignorant of the weather; for only by that illumination can we understand the wise and far-reaching laws that govern the movements of the atmosphere of our earth. It may be asked why we did not have a weather map before. For the simple reason that the possibility of the map depended upon the telegraph; and until the telegraph had been perfected, whereby we could have reports at the same moment from over a wide expanse of country, it was not possible to have the present daily map. When first inaugurated, it is quite evident, from the map itself, that even its projectors knew not its full value; nor how to perfect it at once. It must be developed little by little. Those in charge of it must feel their way. That they did not at once give us a perfect map is not surprising; the surprising thing, however, is that they have gone on from one advanced step to another till they have given us the perfect map of to-day. And this, let it be borne in mind, has been done without the moral support of those whom it would seem should have been the first to assist in perfecting this grand system whereby we are enlightened as to the medium, the atmosphere in which we live, and but for which our globe would be as lifeless as the moon.

Knowledge of our atmosphere is what the map has given us.

As to the perfection of the present system, it is, as far as the principle is concerned, as perfect as can be. The only thing now to do is to extend the principle.

The great advantage we in the United States have is our extent of territory—a double square of about 1,500 miles north and south by about 3,000 miles east and west—all under one government. One thing in this department has been well established, and that is that we cannot study meteorology in a small territory; therefore the absurdity of the local meteorological societies. They are all confined to a small extent of territory; might as well attempt to study the tidal system of the world in a mill-pond, as to attempt to study meteorology entirely in a country of small area. If one doubts this, let him follow up the weather map even for a few weeks and notice the movements of the atmosphere thereon recorded. These movements will at once be seen to be on a large scale.

The perfection of meteorology depends upon the reports whereby the map is formed; simultaneous reports, three times a day at least, sent in to headquarters, where they are tabulated and a map printed therefrom. By the map we have discovered that the general movement of the atmosphere is from the west toward the east, or toward the rising sun.

The atmosphere is divided into two grand factors, high and low barometer, technically, for short, termed "high" and "low." These move around the world, from the west towards the east; not, however, on regular lines. We see them appear in the west—cross the country—and disappear in the east. We track them across the ocean; they are all the while appearing in the west, and, so far as we can trace them, disappearing in the east. We cannot at present prove that they travel around the world, but we infer that they do; and we have not the least doubt but what the future will prove this. Now, as these factors, "high" and "low," thus move, it follows that the more stations we have

the better, and that the stations in the west are more important than those in the east. We want stations, however, all over the country, and we may say all over the world. The more we have the better. In the East there are many stations within fifty miles of each other. Out West they are three and five hundred miles apart. Then, again, the telegraph communications in the far West are frequently interrupted, so that practically the distance between stations becomes much greater.

The "lows," which seem to be the governing feature, may be said to enter the United States at four general points—the extreme Northwest, in the neighborhood of Washington Territory; the Southwest, or near the head of the Gulf of California; through Central Mexico, Texas, and the Gulf; and occasionally from the West Indies. Therefore, we want more stations in these several directions—more in the far Northwest and Southwest, some through Mexico, and even the Gulf, and a few in the West Indies. In addition to the one at Havana, one on the extreme eastern end of the island of Cuba, and one farther north on the islands of Bermuda. The storms that come from the southeast quarter may seem to counteract the law that the movement of the atmosphere is from the west toward the east. If we will refer to the map, we will see that although this is a general law, the movement is, at times, even for a great distance, almost due north or due south, and occasionally even toward the west. But whatever the local or special movement may be, the general movement is as herein stated. When it is otherwise, it is only for a short time, and sooner or later the easterly movement is resumed. From the inequality of the surface, the direction of these forces on land are very irregular, while on the ocean, where there are no counteracting influences, such as combinations of land and water, mountain-chains, plains, &c., the direction or course is very regular—almost due east. We need a few stations in our South and East, in order to be forewarned of these "lows" that occasionally, more particularly during the late summer months, at present come so suddenly upon us from that quarter.

The next point I would offer is the "skeleton-map" idea. The present map is most valuable as a scientific instructor and for practical purposes near at hand, but we know that the mail cannot deliver one of these maps farther away than about 500 miles in twenty-four hours. Then, sending the map to the West is sending it toward the approaching movement, whereby the time is still further reduced. We could have a number of centers where a map could be printed and issued, but this would be expensive and unsatisfactory. In addition to the map now published at Washington let us adopt the "skeleton-map" system. Let the map of the United States and surrounding country, as much as we can cover by stations, be divided into squares, on lines of latitude and longitude. As to the size of these subdivisions, let that be determined by the practical tests. Squares not too large or too small. I think about seven or ten squares in length, from west to east, and the same proportion from south to north, would be a very good size. Say, have the squares numbered and the intersecting lines lettered, or the reverse. This would give us a very simple and convenient system. Throughout the country, in every office and household, they can have their "skeleton map" suspended on the wall, say beside the calendar; and even smaller editions can be published in the columns of our daily papers. In place of or auxiliary to the present plan, let the central office telegraph all over the country the location of the "highs" and "lows," even three times a day; and in addition, at the post-offices or newspaper offices, let there be large blackboards with the skeleton map thereon in plain white lines.

As the report is received some handy person with a piece of chalk can step up to the board-map and thereon make a few lines—indicate the "high" and the "low." The public will soon learn to read it; and when they do, they have something valuable. Then they are not only obtaining some local information valuable to them for the next few hours, but, as it were, they are taking in the scope of the whole country, and know what conditions prevail where their friendly or business interests may be, even thousands of miles away, and, in addition to this, they are the while receiving practical instructions in meteorology. No longer will they be imposed upon by the many erroneous sayings that are so common about the weather, and as for the so-called "weather prophets," their silly vocation will be at an end. The world will have light and not darkness to guide them, and they will soon grasp it and realize the glorious scientific revolution that has been wrought by that wonderful illuminator, the weather map.

ISAAC P. NOYES.

WASHINGTON, D. C., *February* 23, 1886.

The consideration of the fourth topic was then taken up.

Lieutenant Dunwoody said he would like to know the different plans under this head that have been used in the several services, and would like to hear their merits and demerits discussed, as he thought this was a means of enabling the Signal Service to utilize the State weather services, and with their co-operation an opportunity would be given the Signal Service for intercourse with the people.

Mr. Davis said he would like to hear from Ohio first on this matter, as he believed the

first formal plan of weather signals orignated there under the direction of the chairman, Professor Mendenhall. He was sorry that he was not able to approve of the Ohio plan. He thought there ought to be something more simple than the six or seven flag system. He thought the number of signals now displayed very small to what should be displayed.

Mr. Thomas presumed the members of the conference were quite familiar with the system of signals in use in Ohio, as they are the signals which have been adopted by the Signal Service. (Mr. Thomas exhibited cards showing the signals, and said that the cold-wave signal would be printed on the next supply.) He could not give precise information as to the extent to which these signals are used, because there were a number of private parties who have provided themselves with flags and display the signals from information obtained in the morning newspapers, from railroad offices, and from the Signal Service stations. There has been great activity in Ohio in the past six months in this respect. There are ten stations named by the bureau as the recipients of special-prediction telegrams. The Signal Service had asked his service to aid them in designating the persons at these points who should receive these telegrams. In certain cases some of the corporate bodies of cities, towns, and villages have directed different local officers—in some cases the fire departments, police departments, and kindred organizations—to attend to the receipt of these telegrams, and made it a part of their regular duties to display these flags upon some prominent point in the cities or towns. A number of private business firms are using the signals, and display them as little signs on the fronts of their places of business. The general method of display is that of a flag from a flag-staff. In Columbus the bureau has displayed the signals after the manner of banners on a rope across the street; but in these cases the flags are soon worn out by the wind, and the practice has been discontinued. As to the simplicity of the signals, he did not think it necessary to simplify the system at all, as school children understand exactly what is meant by the signals. He did not think the system is at all objectionable upon the score of complexity or difficulty of the people to understand it. He described the manner in which these signals were displayed on the sides of baggage cars on some of the railroads in Ohio. These signals are quite popular in the region through which the trains pass, but people at a distance from the roads would like to have audible signals. Some of the factories have undertaken to whistle the signals, but with what success he did not know.

Mr. Davis said that in New England they took up the Ohio system of flags on the recommendation of the Signal Service. They have a certain number of telegrams allowed them by the Signal Service, and the information is sent by telegraph or telephone to the different New England stations and to persons who agree to display the flags. In that way a small number of people is reached. One of the difficulties in the way of getting people to display these signals is the cost of the flags, which is $8.50 per set.

The New England service has a scheme for the State to take up the matter of the distribution of messages to all telephone exchanges, the exchanges agreeing to send two a day to local points, and he thought if the States took this matter up it was very important to adopt a permanent system of signals before it was done. In order to have the system succeed it would be very important to have the States pay for the flags. The expenses of the service could be diminished one-half in that way. The number of flags could be reduced. He would indicate higher and lower temperature by the attitude of the temperature flag, and thought that the local and general rains could be embraced in one flag. He would not have a flag for stationary temperature, but would have a fair-weather flag. There should be a little streamer to indicate the beginning of the signals, so that the signals could be read when displayed horizontally. He would like to see some simplification of these signals in this way: Temperature indicated by one flag, stationary temperature flag omitted, and, if possible, local and general rains indicated by a single flag. Then there should be a change in the time of receipt of the indications. He thought the matter could be greatly aided if they could get the indications for to-morrow, say, at noon to-day, disregarding the weather for the afternoon. He thought too much attention was given to the actual weather in the indication and not enough to anticipated weather. Referring to the form of weather signals, he suggested that it is not necessary to have any figure or symbol on the flag, but simply to have a red flag to designate temperature and the blue flag for rain, and, in case the flags are hung horizontally, have a little streamer to indicate the beginning of the signal and spaces to show "followed by."

Mr. Mell said it was not his intention when he adopted the signals in use in Alabama to run in opposition to the Ohio system. He took charge of the Alabama weather service after Professor Mendenhall established the system in Ohio, and he made an attempt to use the Ohio system in his State. It is very well to expose the signals on railroad trains, but it is better to have them displayed at the stations. He had been greatly aided in his system by the different railroad companies in his State. One road not only telegraphed the signals, but bought the flags and put them up. Some of the roads objected to using the red flag because it was their danger signal, and would therefore be confus-

ing to their railroad employés. For this reason he had adopted the orange color. (Mr. Mell here exhibited a set of his flags, and explained at length his system of signals.)

He used a square white flag for fair weather, square orange flag for local rains, and square blue flag for general rain, a triangular-shaped black flag for temperature. On some of the roads he was required to get parties to take charge of the signals. Referring to the Ohio system, he said that he found difficulty in reading the flags when they hung close to the staff; he could not tell whether it was the moon or the star. His flags were made of calico, owing to its durability and cheapness. A set of the flags cost $2. He had found newspapers that published his symbols without the colors, but with description of each printed thereon. He had found difficulty in convincing the Western Union Telegraph Company that his system was a good thing and that they should send these signals free. The company had uniformly declined to aid in the cause. In preparing his system he found the thing to be secured was simplicity, something that the people could easily understand, and he believed his system attained this object. He thought the flag for general rains might be done away with, and this would leave three flags. He had printed the cold-wave flag on his card for the convenience of the people with whom it was popular. The cold-wave flag had been displayed from the college building, and could be seen at a great distance.

Mr. Upton inquired why the peculiar shape of the temperature flag had been adopted.

Mr. Mell could not give any special reason for the triangular shape of this flag. It had been decided upon for no particular reason. For "followed by" he leaves the space of one flag between the signals.

Mr. Davis said he had been able to do but very little with railroads in New England, with the exception of the Old Colony Railroad Company, which displayed the signals on its trains.

Mr. Mell thought his system the best that could be devised as to simplicity. He explained that in telegraphing the indications—say, fair weather, higher temperature—he would simply say "white below black." The railroad superintendent receiving this telegram would put it into his dispatcher's hands, and the dispatcher telegraphs the same wording over his lines to the agents. Time is a very important item; these signals must be sent out promptly or they would be of no service at all. The telegraph companies are not always prompt about this matter.

Mr. Thomas stated that no recommendation had been made with reference to a system of whistling signals in Ohio. Some parties had taken the matter up, but he had not been advised in regard to the method of signals. Efforts were made to induce the railroad companies to whistle these signals, but they declined, as it would confuse their own signals. The Ohio system had become largely used, yet those who are connected with that system are not so firmly attached to it that they would be unwilling to adopt any good uniform system of signals that the conference might decide upon. There was another point in connection with the topic under discussion which he would like to refer to, and that was a rule of the Western Union Telegraph Company not to give to any person, except the one addressed, the contents of any message sent over their lines. He thought that by joint action of the conference and the Signal Service this rule might be modified as far as related to these weather telegrams.

Mr. Mell explained how the railroad telegraph operators signaled to attract the attention of the operators along the lines, after the manner of the time signals, and then began sending the weather signals.

Mr. Thomas said that the train-dispatchers of the several roads in Ohio sent out the predictions in the morning, and sometimes used the figure 3 to call the attention of the operators.

The chairman (Professor Mendenhall) questioned whether the conference was ready for action on the question under consideration. The matter of the display of signals was one of great importance. He explained that when the Ohio system was first originated it was not intended to be a universal system. The question of form, of color, and of position were all to be considered, and the most desirable should be selected. The emblems, sun, moon, and star, were designated primarily for use on the sides of cars, and not for hanging flags. Various forms of flags, consisting of solid colors, were experimented with at the time of the conception of the Ohio system, and the result was the adoption of the sun, moon, and star. Professor Mell's signals involve position, and there is great difficulty in this element. Referring to the drum signals, he said that they had form and position both, and thought they possessed many advantages over the flag system. One difficulty with the flag system was that they could not be seen in a great plain. He saw only one reason for immediate action on this question, and that was that by and by we shall have great difficulty in making any change in the system after thousands of the present signals have been scattered over the country. He did not think the conference was ready to vote the adoption or make a recommendation of any particular system of weather signals, and suggested that it would be more advisable to appoint a committee of members of this conference to consider the different systems of signals in use and

to accept suggestions in the matter during the next six months; and after carefully considering the whole matter, the committee could make its report.

Mr. Davis objected to a long postponement. The chances were that the State of Massachusetts would take up the system of weather signals, and that by the early summer, if at all, and if such action was taken by the State his service would have to use the system that is now in use or one that might not meet with approval.

Mr. Upton said that the action that he was about to suggest was that a committee be appointed to consider the question, and that it be directed to report progress, at least, to-morrow.

Mr. Fuertes stated that he had no favorite system. Described a system in use in New York by means of a mast, provided with yard-arms, from which the signals are indicated by combinations of balls.

Mr. Thomas moved that a committee of five be appointed to consider the question of a uniform system of weather signals and to receive suggestions in this connection, and to report progress to this conference to-morrow afternoon.

The motion was adopted, and the chair appointed Professors Davis, Thomas, and Mell, and Lieutenants Dunwoody and Woodruff as the committee.

The conference then adjourned until Thursday morning at 10 o'clock.

NATIONAL MUSEUM, WASHINGTON, D. C.,
Thursday, February 25, 1886.

The conference was called to order by the chairman (Professor Mendenhall) at 10 o'clock a. m.

The discussion of the third topic: "Location of instruments, especially of rain-gauges," was resumed as unfinished business.

Mr. Mell offered the following motion as the opinion of the conference regarding the exposure of rain-gauges.

That the collecting edge of the rain-gauges shall be exposed as nearly as practicable about 12 inches above the surface of the ground, to be in open ground if possible, and not nearer any object than twice the height of that object.

Mr. Gillingham, Virginia, inquired what the advantage was in having the gauge so near the ground. He thought the rain-gauge should be protected from the interference of children, stock, &c., and that this protection could not be had if the gauge were placed on the ground. He thought the gauge ought to be elevated in order to be out of harm's way. His gauge was exposed about 6 feet above the ground on a post, in an open space.

Mr. Upton explained why the New England service had adopted the ground exposure. They had done it for two reasons. They desired, first, to get the rain that actually falls on the ground, and they only wanted to place the top of the gauge high enough to escape spattering. Others had dug into the ground and placed the gauge with the top of the instrument protected by a ditch to protect it from spattering. The other reason was that in locating the instrument on the ground they accorded with the plan used in England. There are 4,000 gauges in use there, and the rule there is very rigid. Lieutenant Dunwoody said that the Signal Service exposed many of its gauges on the roof, not because it had been determined that roof-exposure was the best, but because the Service had practical duties which required its observers to be located in commercial centers, and for that reason it was usually unable to have the rain-gauges exposed on the ground. The observers are necessarily compelled to make their observations at the station offices that they may be promptly telegraphed to the central office, so that it is not always possible for the Service to select a point for the exposure of its rain-gauge on the ground. They may at some time be able to secure reports from observers outside of cities, and these would be preferable to those taken in the centers of cities. These remarks were made that the conference might understand that although the Signal Service rain-gauges were exposed upon the roof, yet it was not to be considered that the service preferred this exposure.

Mr. Rotch suggested that a great objection to roof-exposure of rain-gauge was the action of the wind on the rain. Experiments had shown that there was decrease of rainfall nearly two-thirds at a distance of 60 feet above the ground. He did not know whether that difference was attributable to the wind or not.

Mr. Mell said one reason for locating the gauge one foot above the ground was the fact that the New England service had tried this plan in a general way and had arrived at very satisfactory results. The New England service had recommended this matter to the different services. It has been adopted there, and there is no other regular method in the country. It would be easier to have the different sections of the country adopt a system that has proved satisfactory than to have these gentlemen in New England adopt a new system. He had not recommended any particular exposure, because he had, in experimenting, found that there was a material difference between the two positions.

He had not recommended a change because the Signal Service was using a different location. He thought it would be preferable to adopt the height of 1 foot for the reasons stated.

Mr. McAdie thought there should be a fence round the gauge to prevent interference by outsiders.

The chairman thought there should be some such protection to the rain-gauge. There was no difference in results between rain-gauges exposed 6 feet and 1 foot above the ground.

Mr. Mell's motion, modified to read as follows, was adopted:

That the conference recommends that whenever practicable, rain-gauges be placed with the collecting edge one foot above the ground and that it stand at least as far from adjacent objects, such as trees, buildings, &c., as twice the height of these objects; and that the conference disapproved of roof-exposures.

The form of rain-gauge to be used by the several services was next considered.

Mr. Mell thought the conference might adopt the gauge that is now in use by the Signal Service, and change it to some extent to adapt it to their purposes. He did not like the edge at the mouth of that gauge, and thought some error might be avoided by changing it somewhat; he would flare the edge out.

The chair stated that the present gauge does not have the beaded edge. A new form of gauge has been adopted, and it is entirely free from that objection.

Mr. Thomas said that the Ohio weather service is using the Signal Service gauges, and made the following motion:

That the form of rain-gauge now made by the Signal Service and in use by the Ohio State weather service be adopted as the standard rain-gauge, and that the several State weather services be asked to adopt this gauge as far as practicable.

Mr. Mell would like to have a gauge with a sharp, well-defined edge.

Mr. Upton said there was a slight difference between the gauges used in the New England service and those used by the Signal Service. Some of the gauges have the tube entirely separated from the gauge. Certain observers like to take the gauge into the house and pour the water into the measuring tube.

Mr. Redding stated that he had difficulty in sending his rain-gauges through the mail to his stations on account of the edges being broken.

The Chair stated that the Signal Service gauge was made by contract with the lowest bidder, and the cost had varied from $3.40 apiece for the first 100 gauges to $3.30 for the last lot made. If the conference decided to recommend this gauge, they could probably be obtained here in Washington by the Signal Service cheaper than they could be bought by individuals. The gauge now used was the result of long investigation by the officers of the Signal Service.

Mr. Upton thought the conference would be safe in adopting the result of this investigation. The Signal Service gauge accorded with similar experiments made in other places.

Lieutenant Woodruff said the new Signal Service gauge was made as far as possible according to a standard, and the old gauges on hand were altered to agree with the standard. It was concluded that if those bodies which wished to make observations could approach as nearly as possible to the standard in some cheaper material as far as possible, the Signal Service would replace the old gauge with a proper standard gauge or the nearest approach to that standard.

Mr. Upton inquired whether the Signal Service would sell the smaller gauge (3 inch) which was on the list for $1.50?

The Chair stated that he thought not.

Lieutenant Dunwoody said a smaller gauge was made for sending by mail to meet the demands of the Post-Office Department.

The object of this standard was to secure a gauge that would give good results. In making experiments with these gauges at Fort Myer, for the purpose of securing a standard, it was found that there was but very little difference in results between the smaller and larger gauges. The smaller gauge caught more water, but very slightly, not more than one or two per cent. This increase of rainfall as shown by the small gauge was attributed to the fact that the rim of the small gauge was sharp, and the rim of the larger one was turned. A gauge should be made with the rim of the funnel sufficiently rigid to prevent jamming and to secure a uniformly circular opening at the top.

Mr. Thomas's motion, modified to read as follows, was adopted:

That the Signal Service rain-gauge be accepted as a standard, and all State weather services be recommended to approximate it as nearly as possible.

A member inquired as to the proper time of reading rain-gauge, whether at fixed hours during a storm or at the end of the rain.

Mr. Russell said 7 a. m., 3 p. m., and 11 p. m., were the hours in the Signal Service, irrespective of the duration of the storm.

Mr. Upton said it was the custom in the New England service for the observers to read their gauges after the storm has ceased, and to look at it in the morning; or if they wished to read it at stated hours they could do so.

The conference then proceeded to consider the fifth topic, "Scale for estimating wind velocities."

Mr. Fuertes thought the conference should adopt the decimal scale for estimating wind velocities.

Mr. Hazen said the decimal scale for estimating wind velocity as far as it was concerned was good enough, but it would be much better to use half the Beaufort scale of 0 to 12, as recommended by some. With a scale of 0 to 6 he thought there would be no difficulty in estimating wind velocity. He explained that force 1 would just move the leaves of trees; force 2 would move small branches; force 3, larger branches of trees, &c.

Mr. Davis said that in regard to the use of a long scale, that is, a scale of more than 5 or 6, he was in favor of the smaller scale for voluntary observers.

Mr. Houston, of Indiana, urged his observers to be very careful in estimating and reporting velocities of wind. One of his observers had sent in a record of 60 miles per hour on one occasion, which was very much more than the actual velocity at the time. He did not know, however, whether this was the fault of the long scale or not.

Mr. Mell stated that what is needed is something that ordinary observers will understand. He had found the same difficulty with his observers that Mr. Houston referred to.

Lieutenant Dunwoody said that it seemed to him that the object of estimating these wind velocities could be attained by using the ordinary terms in the Signal Service reports, for instance, in Instructions to Voluntary Observers the scale given for the use of those who do not have an anemometer with which to measure the wind, the scale is indicated by the words, "calm," "light," "gentle," "fresh," "gale," &c. He could not see why these instructions could not be used on the blanks furnished. Instead of converting the terms "calm," "light," &c., to figures, why cannot you write on the blanks these terms, and let the observer use his judgment, and we would know at once what the measured velocity was.

Mr. Rotch believed that uniformity could be secured by the use of pressure plates. They could be made at little cost.

Mr. Hazen said that in recommending a new scale to be adopted by voluntary observers it is not necessary to use the figures, but the words could be used as suggested by Lieutenant Dunwoody, and offered the following motion:

That the conference adopt the scale of 0 to 6 for measuring wind velocities, in place of the present scale of 0 to 10.

The motion was seconded.

Mr. Fuertes moved to amend by making the scale 0 to 5.

Mr. Davis inquired whether Signal Service instructions would be modified in case a change was made by the conference in the scale. He preferred to take no action that would differ from those instructions.

Mr. Mell thought it would be better to leave it to the committee to confer with the Signal Service authorities.

Mr. Thomas said the discussion had developed the fact that there was no uniformity of opinion in this matter, and thought some simple expedient, as suggested by Mr. Rotch, might be used. It would be better to defer the whole question until another meeting of the conference, and moved to lay Mr. Hazen's motion on the table.

The motion to lay the motion of Mr. Hazen on the table was adopted.

The conference then reached the sixth topic, "The possibility of term-day observations, as suggested in the American Meteorological Journal, page 155, 1884."

Lieutenant Dunwoody moved that the Committee on Forms be directed to make its report, and that no discussion of the report be had until the afternoon session.

Lieutenant Dunwoody's motion was agreed to, and Mr. Upton read the report of the Committee on Forms.

Mr. Houston moved that the Committee on Signals be directed to make its report of progress, and that the discussion of same be deferred until the afternoon.

Mr. Houston's motion was adopted, and the report of progress of the Committee on Signals was read by Lieutenant Woodruff.

The conference then adjourned until 1.30 p. m., same day.

AFTERNOON SESSION, FEBRUARY 25, 1886.

The conference met at 1.30 p. m., pursuant to adjournment. Professor Mendenhall in the chair.

The chairman stated that the next business in order was the consideration of the sixth topic, "The possibilities of term-days as suggested by the American Meteorological Journal," which had been temporarily laid over at the morning session. The chair sug-

gested that the secretary was able to state the sense of this proposition, and he thought it advisable for him to do so, that the conference might understand the meaning of the suggestion.

Mr. Davis said the question involved the addition of something to the work of the services. He explained that the deficiency of observations on local storms which made the determination of their action doubtful, might be remedied by appointing special days on which hourly or tri-hourly observations should be taken, with additional records at still more frequent intervals when any change in the atmosphere required it. These special days might be on certain prearranged dates, "term-days," when the records would gather up everything that happened to come along in the passage of the weather; but they would better serve the purpose if they were specially appointed by the Chief Signal Officer only a day or two before their date. For instance, in the event of tornadoes it would be well to have observations during the storms at other places where they are not possible. The plan could be published in advance by circulars and newspaper paragraphs, and then, if while a cyclone was still beyond the Rocky Mountains, the day of its arrival over the upper lakes could be foretold, and there might be thirty to sixty hours' telegraphic notice given by the appointment of such a day for special observations over the whole region east of the Mississippi River. It might be possible to have the discussion of the results of these observations carried on by the local services, and have a tabulated statement sent on to the central office for investigation and study. He thought the accumulation of simple matters of fact as to the general condition of the weather over a large area by many observers had at a time when somewhere in that area more or less meteorological disturbances would take place, would prove of interest.

Mr. Upton believed that Mr. Davis had suggested a very important subject for investigation. The question comes up, what can we do as a conference in the matter of taking it up. If the general weather service wished to engage in this investigation, let the Chief Signal Officer make arrangements to inform the different services of these different term-days. It was to be hoped that the chiefs of the various services in different parts of the country would take sufficient interest in the subject to make the observations. He thought, however, as a conference they could not act upon it.

The chair thought the conference might go so far as to request the Chief Signal Officer to furnish necessary information and plans to the directors of the weather services, when desired so to do. The conference might officially recognize the question to that extent.

Mr. Davis said that so far as the work was concerned in New England, he would be very glad if the conference would aid them to that extent. It is a question rather different from the others to be considered by the conference, and his chief desire was to suggest to the services here represented the consideration of this style of study, and he would like to have the support of the conference in getting from the Chief Signal Officer notification of the term-days, say on the day previous.

Professor Abbe said the object sought to be accomplished was a very desirable one. The notification of the term-day by the Chief Signal Officer could be published in the public press. There could be little objection to that. It is not worth while to send a telegram unless the service is ready to make the observation.

Lieutenant Dunwoody stated that notification by telegraph could be readily given by the Chief Signal Officer to the chiefs of the different State services for special observation. The notification for term-days could be added to the ordinary dispatches containing the indications which are now sent. The preliminary arrangements might be made by the conference. The observers could be notified by postal-card from the State centers. The warning might be given two days in advance, and it could reach the observers within twenty-four hours, so that the plan might be begun with the single expense of telegraphing to the chiefs. For instance, a storm might be approaching from the extreme Rocky Mountain region; the Signal Office could notify Mr. Davis in New England that two days from that date it would be desirable to make these observations. It could be indicated in a single telegram to Mr. Davis that the weather conditions seem to indicate that within two days a storm would reach New England.

Mr. Davis thought the plan could be inaugurated without definite action by the conference.

The chair said if there was no further desire to discuss the subject, and if there was no objection, he would consider the discussion of the subject closed without action.

The conference then considered the seventh topic, "Increase of thunder-storm observations."

Lieutenant Dunwoody said he would like to suggest the consideration of a subject, which seemed to him very important, and that is the form of State weather-service organization. There was a want of harmony in the form of organization. A year ago an effort was made to have the different State legislatures organize these services by a legislative act, but there was a great diversity of plans suggested, and almost all of them differed from each other. Some were in such form as to be generally commended, while others were

at once condemned by others who opposed the system. He thought if a general plan of organization could be formulated, it would be of advantage to the services by securing co-operation or an extension of the services to the several States. What is wanted is an increase in the number of services. Anything that would secure an increase of these services is for the benefit of the country at large and the Signal Service.

The Chair asked Lieutenant Dunwoody to write out his plan, and stated that the subject before the conference was the seventh topic: "Increase of Thunder-storms Observations."

Mr. Hazen said he had spent much time in the last two years in the study of thunder-storms, and his experience had developed certain principles that it might be well to present to the conference: First, too much ground should not be covered. This had been his experience. It is necessary to have a large number of observations over a small field, and to study there before we go over a larger field. He thought it very important that the State services take up the matter for themselves. The stations of observations should not be more than 4 miles apart to give the best results. Another point is the observation of rainfall and electricity. Another line of investigation has been proposed during the present year, and that is, when a storm of great violence occurs, special requests be sent out for reports. The concentration of this work in different parts of the country is the most important thing at the present time. The present form of report is very simple, and school children could make the observations if necessary.

Mr. Davis thought the question was in the same attitude as the previous one. It belongs to those services who desire to take it up. In regard to the style of the work, there were one or two points he would like to add to what Mr. Hazen had said. Instead of having a uniform plan of record, he thought that the work asked for should be graded. In that way they should be able to gather in something. They should not restrict the observations from those persons who could do a great deal more. There should be a series of forms for the purpose of gathering the reports. He thought the omission of the temperature records left out a very important element in the thunder-storm. There is a lack of cohesion in the observations. The direction of the wind is to be taken at some time, but just when is not stated. He would have two classes of observers, called respectively class A and class B. One class would make observations every half hour during the storm, when all the elements should be observed. The other class could take notes of beginning and ending of thunder, &c. In that way correlate the observations and in that way they could secure material for making synchronous maps of thunder-storms, similar to those made out by the Signal Service for larger storms. The work would be considerable, but if the State desired to undertake it, the observations might be taken, discussed, and studied, and then turned over to the Signal Office. There would be two kinds of cards used in this plan, one for thunder data; the other for rain and wind. Mr. Davis explained by illustration on the black-board his proposed plan of making thunder-storm observations.

The Chair stated if there was no further discussion under this head and no action suggested, the consideration of this topic would be closed.

There being no objection it was so ordered.

The Chair stated that the seventh topic was the last of the questions laid down for consideration, but that several subjects had been handed him by members of the conference for discussion, and he desired to know the wish of the meeting regarding their consideration at this time.

Mr. Houston suggested that it would be well to continue the discussion of the reports of the committee on signals, and that on forms, which had been read at the morning session. He thought the questions referred to by the Chair would cause considerable discussion, and he thought the questions of signals and forms very important and they should be considered first.

The Chair stated that the third regular topic, "Form of publication of results," which was one of considerable importance, was laid over for consideration in order that the report of the committee on forms might be heard.

Mr. Davis said that perhaps the difficulty in considering the matter is that sufficient funds are not in the hands of the service to do what they would like. In many observations of the State services the dates of reports are given, but not the hours. It would be a great advantage to have the hours. He did not like to make a motion that the hours of making the reports should be given.

The Chair stated that some one should make the motion on account of its importance. An arrangement will be made in the new form for having reports of times of special meteorological phenomena. If there was no desire to take any action with regard to the third topic, and if there was no objection, the consideration of this topic would be declared closed.

There being no objection it was so ordered. The Chair stated that the report of the committee on signals contained certain recommendations which should be acted upon by the conference, and desired to know whether the conference was ready to act upon

them. He hoped the committee would be continued, and thought the Chief Signal Officer would be glad to have its advice in this matter. It should be continued as the representative of the conference in this work.

Mr. Upton moved that the recommendations of the committee on signals be adopted.

The recommendations of the committee as read were adopted.

The Chair inquired if there was any further action to be taken with regard to the committee on signals.

Mr. Houston moved that the committee on weather signals be continued until it is discharged by the conference.

The motion was adopted.

Lieutenant Dunwoody suggested that some means should be taken for the publication of the report of the committee. He would like to have the authority of the conference, should the committee determine to make its report after the adjournment, to include the report in the proceedings of the conference.

The Chair thought a motion to this effect should be made.

Mr. Mell inquired to whom the committee was to report.

Mr. Thomas thought the question of the time of report of the committee's report was somewhat mixed.

The Chair suggested that if another meeting of the conference could be provided for, the committee could make its report at that meeting.

Mr. Mell moved that the conference resolve itself into a permanent organization, that the work of the organization be in meteorology, and that the sessions be called at any time.

The Chair ruled this motion out of order, another question being before the conference.

Mr. Fuertes moved that the question of the report of the committee on weather signals be laid on the table, and the subject of permanent organization of the conference be taken up.

Mr. Fuertes's motion was agreed to.

Mr. Mell moved that the conference resolve itself into a permanent organization, for the purpose of advancement in meteorological knowledge.

Mr. Mell's motion was adopted, and the Chair stated that it had been decided to organize the conference into a permanent body.

Mr. Fuertes moved that a committee of five be appointed, of which the present chairman of this conference shall be chairman, and on which the officers of the Signal Service shall be fully represented, to consider and report, at some future time, a plan of permanent organization of the conference.

Mr. Fuertes's motion was adopted.

The chairman inquired how the committee was to be appointed.

Mr. Mell suggested by the Chair.

The Chair said that he would rather have the conference name the members of the committee, and deferred the appointment for the time.

The conference then took up the question regarding the report of the committee on weather signals, which had been laid on the table.

The Chair inquired what further instruction the conference desired to give the committee on the subject of its report or any other subject connected with its work.

Mr. Upton thought it important that when the committee had agreed upon the signals, the system should be put into operation without delay. The committee could report to the Chief Signal Officer, and the Signal Office could inform the chiefs of the various State services of the results.

Mr. Davis believed that the plan suggested by Mr. Upton would accomplish the end desired. It would not do to wait until the next meeting.

Mr. Thomas said that it seemed to him that the matter of weather signals would be in the future a very important one, and it was a question which should not be decided upon finally without a full and free discussion upon the part of those concerned. For that reason he felt loath to propose as final action the conclusions of the committee unless they were reached after a meeting of the committee and not by simple correspondence. In view of the importance of the subject, he felt that it would be quite desirable that there should be a full meeting of the association on that one topic, and the meeting could be arranged for at the close of the spring work, say in June. There were other services, not represented at the meeting, who might come at a second meeting.

Mr. Mell thought a satisfactory result could be reached by taking the various signals and making experimental tests. He thought the matter had resolved itself simply into the questions: Which signals are the simplest; which are the cheapest; which can be seen with most distinctness, and understood by the people, and that was all. The question which this committee will have to consider, was which one of the systems of signals was the best. That action could be accomplished by the committee within a few weeks at least, and there was no necessity for deferring action until a later session.

Mr. Davis said it was suggested that there might be difficulty on account of certain services not understanding what the report of the committee would be. One of the points that must be reached was the agreement of all the services to use the signals to be adopted. He moved that the committee be instructed to report to the Chief Signal Officer when they have agreed upon a plan of signals, and this plan be adopted by the conference.

The Chair said it should be remembered that the Chief Signal Officer would eventually decide this question, and the committee could be an advisory one.

Mr. Upton believed that the committee had virtually full powers already, and if it be requested to report at a future meeting of the conference, the latter would accept the report.

Mr. Houston said in regard to the convention accepting this report that it did not imply that they must accept the system of signals and use them as reported upon by the committee. Thinks the report should be qualified as far as practicable.

The Chair said the committee was appointed to consider certain recommendations and make a report of the result to the Chief Signal Officer.

Mr. Davis thought that meant that the committee had full powers. It meant that the conference would trust the committee to do something which the former would indorse. This committee was to co-operate with the Chief Signal Officer in the study of this question and when it has reached a result it is to report the conclusions to the Chief Signal Officer. As he understood it, the action of the conference could only be amendatory.

Mr. Thomas said the acceptance of this report embraced one action which the conference ought to take. As it was, he thought it not at all unlikely that a system of signals which might be used by the Chief Signal Officer, might be different from that used by the different State weather services in their own individual display, and it seemed to him very desirable that there should be uniformity in the signals throughout the country. The committee should make its report as simply the recommendation of the committee.

Mr. Davis withdrew his first motion, and offered the following in its place:

That the committee on weather signals be instructed to report to the Chief Signal Officer the results of its investigations and the recommendations which it has to make.

There being no further discussion, the motion was passed.

The Chair stated that this disposed of the regular order of business, and desired to know the will of the conference regarding certain subjects handed him by members, to which he before referred.

He said he had three questions on his table for consideration. Two of these subjects related to the State weather services. One was, "What is the best form of organization for State weather services?" and the other, "Consideration of the relation of voluntary observers to the Signal Service and to the State weather services in States where local services are established."

Mr. Upton moved that the conference consider the general question of the best form of organization for State weather services.

There being no objection, this question was taken up.

Mr. Davis said he would like to call attention to the difference between the State services and the New England Meteorological Society. The State services as a rule did not intend to discuss meteorological matters or make investigations beyond the matters of observation and tabulation. The New England association had a constitution, officers, &c., and a staff of observers scattered over the State. The object was the study of atmospheric phenomena in New England. It welcomes to membership all persons interested in meteorology, whether they took observations or not. It published its own bulletin containing its records, and the society co-operated with the Signal Service in publishing its results and predictions. It had no State aid; it was supported by the fees of its membership and certain funds which the organization had been fortunate enough to obtain. The organization hoped to secure State recognition. The matter of investigation and discussion of meteorological data should be considered as well as the taking of observations.

With regard to the last point suggested the chairman spoke as follows: It occurred to him that there might be difficulty in securing State appropriations to a society. An appropriation to a State system or a bureau was one thing, and an appropriation to a society engaged in purely scientific work was another. In his own State he knew that while several societies labored hard to procure appropriations from the legislature they have always failed.

Mr. Davis said they had the difficulty of having to meet several legislatures. They have had boards of health or agriculture, and in combining with those boards, by the society virtually giving its work to the State, they got some support in return.

Lieutenant Dunwoody stated that he had had some experience in endeavoring to se-

cure the organization of State weather services, and several bills had been presented to various legislatures, and although they had considerable hope when they presented them, all the bills failed. The State legislatures could not be depended upon to support these services. They had many encouraging reports from these services about two years ago, but their hopes were blasted by the want of appreciation on the part of the intelligent legislator. They had made light of it, and had laughed at it, and they did not seem to appreciate its value. He had worked with these services with a view to securing State aid, knowing that it would quadruple the value of the Signal Service work to the country. One dollar expended in telegraphing to these services would be worth thousands of dollars to the States. Send these Signal Service reports out to cities where no one is to take charge of them, and nothing will be done in the way of distributing them. He hoped to get more favorable action from the legislatures during the coming year. In the mean time all the Signal Service could do to aid in supporting these services was to furnish the franked envelopes and blank forms. The Signal Service had supplied several rain-gauges to certain States, to Tennessee, Ohio, &c. Professor Mell had organized his service without any material State aid, and the Signal Service sends him the indications by telegraph, and he had received the co-operation of railroads in disseminating the information. This is one of the prime objects of the Signal Service. It is an important and interesting work. They were accumulating data in Washington, and the service was unable to give the results to the people for want of facilities. The Associated Press did not reach certain localities, and the State services could be of great use in this respect, and he hoped they would be able to increase the number of organizations. The plan to pay the observers, as was done by Professor Baker in Michigan, might be a good one. The organization in Iowa is very similar to the one in Ohio, but not so well supported. He was sorry that a representative of the service was not present. This service had a good mode of making its reports; they are well tabulated and discussed.

Mr. Houston suggested that in those States where State aid could not be obtained, they might get aid from the State in an indirect way. It had been done in Indiana.

Mr. Davis said they had gone on for more than a year in New England without asking State aid, but they now propose to ask for funds to be disbursed through the agricultural societies of the State.

Mr. Mell said that in Alabama he had made no direct appeal to the legislature. He had resorted to other means. The State Agricultural and Technological College, at Auburn, with which he was connected, has an appropriation from the General Government; besides that, the State government had given it about $30,000 for the purpose of scientific investigation. He prevailed upon the board of trustees to give him a sufficient amount of money to publish his monthly bulletin. Connected with the college was a printing establishment worked by the students, and he put these boys to work on the bulletin, and the form of bulletin, cards, &c., shown was the result of the students' work. He could issue all the bulletins necessary in that way. Many of his observers wanted pay for the work they were doing. Of course, they could not do this. He proposes at the next session of the legislature to make a forcible appeal for recognition, and he had some reason to suppose that he would be successful.

Lieutenant Dunwoody stated there was a bill before Congress to appropriate a large sum of money to enable the Chief Signal Officer to distribute the weather indications by means of signals, &c. If such a bill as that became a law, there will be no trouble about the State weather services, because the Signal Service would have the money to spend, say $3,000 in each State, and each State would have a substantial organization, and probably a signal man to assist in collecting and discussing their data. He did not know of an appropriation before Congress that would be more acceptable to the people of the country or more beneficial. He, however, did not think it would be favorably considered. A bill had been introduced by Mr. Cabell for a large amount of money for the purpose of enabling the Chief Signal Officer to telegraph the indications to the post-offices, &c., throughout the country. If there is any opportunity or chance for success in this matter, it will solve the question of State weather services, and there would be State services in every State in the Union.

Lieutenant Woodruff said, in reference to the bill spoken of by Lieutenant Dunwoody, that as it was a measure of so much importance to the interest of the State weather services, and to the people of the State themselves, it would be very proper for the representatives of the State services present to see what they could do to enable the bill to become a law, that is, they should take such action as to impress upon their representatives in Congress the necessity for the passage of such a bill. The State services should use their influence in having the bill passed. There is no doubt but that the money would be of very great assistance in the direction referred to.

The chair said if there was no further discussion upon the general question under consideration, there were two special questions yet to be considered to which he had already referred.

There being no objection, discussion of the general question of organization of State weather services was closed without action.

The chair then laid before the conference the special topic: "The relation of voluntary observers to the Signal Service and the State weather service in States where local services are established.

Mr. Davis stated that as he had suggested the question in that form he would give his reasons. It seemed to him there was a necessity for the voluntary observers to continue to report to the chiefs of the local services, and in the cases of new voluntary observers it was an aid to the local services, and they should be officially requested to report to these services, because the services are just so far discredited in the eyes of the local observers. The conference ought to take some such action. He inquired whether the policy of the Signal Office was settled in that respect, and if so, in what direction was it settled.

Lieutenant Dunwoody said with regard to the organization of the State services, it was originally intended to transfer the voluntary observers to the State services as soon as they were properly organized. He thought it was very well to carry out that line of action; and that would be the policy of the Signal Office. But as there were a number of States where local services do not exist, it would be necessary for the office to continue their voluntary observers in those States.

Mr. Davis said if such was the case the conference need take no action upon the subject. His society would like to be recognized as the local authority in the New England States.

There being no further discussion, the question under consideration was passed over without action.

The conference then considered the last suggested topic: "How far voluntary observers and the State weather services should make separate reports to the Chief Signal Officer for the Monthly Weather Review, and how far these should be made by the chiefs of the services."

Mr. Upton said that as he had suggested the topic it would be well for him to state the reason for bringing it up. It had been made necessary by the facts brought out by the last question discussed. The difficulty in New England was that some observers reported to his service and some to the Chief Signal Officer, and there was a third class who reported to another body. If all the voluntary observers reported to the chiefs of the local services, and the Chief Signal Officer received all his reports from the local chiefs, the difficulty would be obviated. The question of documents, which these voluntary observers received in return for their reports, was a source of difficulty. If the documents were turned over to the chiefs of the various services and by them sent out to their voluntary observers, that would do away with this difficulty. If these observers reported to the Chief Signal Officer they got these documents free, while if they would report to the local chiefs they would not get them, because the chiefs have usually not enough to go around. The twenty-five documents received by the New England service were sent to those observers who do not receive them from the Chief Signal Officer. If the transfer of these documents to the State services for distribution could be arranged the plan of having all voluntary observers report to the local services could be completed.

Lieutenant Woodruff said it seemed to him that the question of documents was a little matter of detail that could be regulated in the Signal Office. If the chiefs of the State services sent in lists of their observers to the Chief Signal Officer the publications could be mailed the chiefs from the Signal Office. If the plan was brought to the attention of the Chief Signal Officer he would certainly agree to it.

There being no further discussion, the president declared the consideration of the subject closed without action.

Mr. Fuertes inquired if there were any means provided for publishing the proceedings of the conference.

The chair stated that it was the intention to turn over the report of the proceedings to the Chief Signal Officer to publish as a part of his annual report, and it might possibly be printed in pamphlet form.

Mr. Upton said undoubtedly a summary of the proceedings would be printed in the American Meteorological Journal.

Mr. Davis asked that the secretary be authorized to publish in certain scientific journals an abstract of the proceedings and account of the action taken by the conference on certain subjects.

Mr. Upton moved that the secretary have authority to publish in such scientific journals he chose such abstracts of the proceedings of the conference as he thought desirable or suitable.

The motion was adopted.

The chair announced the names of Professors Mendenhall and Fuertes, Lieutenant Dunwoody, Professors Upton and Payne as the committee on the permanent organization of the conference. The chair said the object of this committee implied the meeting of the conference again, and it had been suggested that when the adjournment of the present session took place it be to meet at the call of the committee on permanent organization, and if there was no objection it would be so understood.

There was no objection, and it was so ordered.

The chair inquired if there was any further business to be brought before the conference. The chair thought it was right that the thanks of the conference be extended to the director of the National Museum for his courtesies to the conference.

The following motion was then adopted:

That the thanks of the conference be extended to the director of the National Museum, through the chairman, for providing a place of meeting for the conference.

Lieutenant Dunwoody suggested that the chair invite the members of the conference to visit the Signal Office on the following day.

The chair stated he was glad to have an opportunity of extending the invitation, and hoped that the members of the conference remaining over would visit the office of the Chief Signal Officer on the next day.

The chair felt complimented in being selected to preside over the conference, and it had been a pleasure to him to preside over their deliberations. It had been a very profitable session.

Lieutenant Woodruff moved that the thanks of the conference be extended to the chairman and secretary for the efficient manner in which they had performed their duties.

The motion was adopted.

The conference then adjourned to meet at the call of the committee on permanent organization.

FEBRUARY 20, 1886.

DEAR SIR: I regret to be compelled to state that it will be impossible for me to attend the meeting of the chiefs of the State weather services and of meteorologists called by your invitation for the 24th and 25th instants.

My interest is rather in climatology than in meteorology proper, and I am hardly prepared to make suggestions or discuss the questions which relate to the work of observing and recording phenomena of weather. There is an important suggestion however about the proper location of stations which I venture to make, and it may be one of the subjects for your discussion, since the end of meteorology is the elucidation of the factors of climate.

I have inclosed a short communication on the New York State stations and their geographical position, which may be of some value as suggesting our needs.

Yours, respectfully,

JOHN C. SMOCK.

General W. B. HAZEN,
Chief Signal Officer, U. S. A.

THE NEW YORK WEATHER STATIONS.

The importance of geographical positions in the selection of meteorological stations is well illustrated in New York. The number of stations from which reports are now received by the Signal Office, the War Department, and the New England Meteorological Society is twenty-six. If that number of stations were quadrupled it would not be too large for so diversified a surface and so extensive a territory.

A station for each 450 square miles would not be too close.

At present the average area per station is 1,800 square miles.

But the irregular distribution makes it practically a much larger area.

In the appended table these 26 stations are grouped according to the several well defined and natural subdivisions of the State.

There are 10 such divisions or districts, and they have stations in them as follows:

First, the maritime or Atlantic coast district, consisting of Long Island, Staten Island, New York, and parts of Rockland and Westchester Counties; has now six stations.

Four of them are within 5 miles of New York City Hall; and Long Island (120 miles long) has one station, outside of Brooklyn.

The Hudson Highlands, consisting of an elevated belt stretching from New Jersey to Connecticut, nearly, has two only, neither of which can be considered as being in representative locations.

The long Hudson Champlain Valley, stretching north to Canada, has three, or if Plattsburg be included, four stations.

The Catskill Plateau, which rises from 1,000 to 4,000 feet above the ocean (a mean of at least 2,000 feet) and which may be said to include the country southwest to the Pennsylvania line, and west into the Susquehanna watershed, has one station.

In the Mohawk Valley there are none, and so in the large Adirondack region there are no stations which report observations.

Plattsburg (if not assigned to the Champlain Valley) becomes the sole representative for the Saint Lawrence Valley below Lake Ontario.

In the Lake Shore belt there are several stations of the Signal Office of the United States, and three voluntary observers.

This district may be said to be the best cared for in the State. In what has been termed the "central belt," the country back from the lakes and extending to the southern plateau counties, there are three stations.

The southern counties occupying the Pennsylvania border and elevated 1,000 to 2,000 feet above tide level, have four stations.

The inadequacy of the stations, as now located to represent the districts, has been shown in that there are two districts which are without stations, and three have (practically) one each only.

The climate of our mountainous regions is neglected, so far as observations which are now being taken are concerned. In view of this deficiency I have thought that possibly the Signal Office might be desirous of knowing of it and might consider the suggestion of making some efforts to solicit the assistance of other voluntary observers in addition to those now on its list in States where no State weather service exists.

The inauguration of such service in the State of New York is a matter of consideration, and to be hoped for speedily, but until that time it is necessary to use all the agencies at hand; and these are nearly all in the service of the United States Signal Office.

If that office can afford us any further or more material help in the establishment of new stations, carefully located, it will do a good work in furthering the study of the climate of the State.

NOTE.—In the appended tabular statement the second column gives the names of the districts; the third, the list of stations; the fourth, the number of the stations per district; and the last column the department or society to which the stations report.

New York meteorological stations, 1885 *and* 1886.

[S. S. V.: Signal Service Voluntary Observer. N. E. M. S.: New England Meteorological Society. Mil. Post: United States Military Post. S. S.: Signal Service.]

Number.	Districts.	Locality and county.	Number of stations.	Society to which stations report.
1	Atlantic coast districts	Setauket, Long Island	1	S. S. V.
		Brooklyn, Long Island	2	N. E. M. S.
		New York City	3	S. S.
		David's Island, New York Harbor	4	Mil. Post.
		Fort Columbus, New York Harbor	5	Mil. Post.
		White Plains, Westchester County	6	S. S. V.
2	Highlands of Hudson	West Point, Orange County	1	Mil. Post.
		Mountainville	2	S. S. V.
3	Hudson—Champlain Valley	Lebanon Springs, Colorado County	1	N. E. M. S.
		Albany	2	S. S.
		Menands, Albany County	3	N. E. M. S.
4	Catskill Plateau	Cooperstown, Otsego County	1	S. S. V.
5	Mohawk Valley			
6	Adirondacks			
7	Saint Lawrence Valley	Plattsburg, Clinton County	1	Mil. Post.
8	Lake Shore belt	Oswego, Oswego County	1	S. S.
		Palermo, Oswego County	2	S. S. V.
		North Volney, Oswego County	3	S. S. V.
		Palmyra, Wayne County	4	S. S. V.
		Rochester, Monroe County	5	S. S.
		Buffalo, Erie County	6	S. S.
9	Central belt	Syracuse, Onondaga County	1	S. S. V.
		Auburn, Cayuga County	2	S. S. V.
		Le Roy, Genesee County	3	S. S. V.
10	Southern Plateau	Ithaca, Tompkins County	1	S. S. V.
		Factoryville, Tioga County	2	S. S. V.
		Penn Yan, Yates County	3	S. S. V.
		Humphrey, Cattaraugus County	4	S. S. V.

POST-OFFICE DEPARTMENT,
OFFICE OF ASSISTANT ATTORNEY-GENERAL,
Washington, D. C., March 17, 1886.

SIR: The communication of General W. B. Hazen, Chief Signal Officer, United States Army, of date January 28, ultimo, was this day referred to me with directions to advise upon the questions therein presented as to the extent of the right to use the penalty envelope for the purposes of collecting information by officers of the Signal Service.

General Hazen says that the Signal Service has been co-operating with a number of local services in the various States. These services are the agents of the Signal Service; they are voluntary observers of the Signal Service and the reports are collected at the State centers and transmitted to the office of the service at the War Department.

These State services, as I understand, are under the charge of chiefs, who organize corps of observers in the several portion of the State; the latter report to the State chiefs, who compile and forward their reports to the Signal Office.

The use of the official or penalty envelope is required in forwarding as well as in the collection of these reports. From the information thus obtained is compiled or prepared a summary which is published in a monthly bulletin by authority of the Secretary of War. The question presented is whether this use to the extent desired is authorized by law.

The State agencies and the corps of "voluntary observers" cannot be said to be "officers of the United States Government." Though they render valuable service in collecting and furnishing information of a public and official character, they are but unofficial volunteers with none of the liabilities or responsibilities of an officer. The act of July 5, 1884 (23 Stat. 158), provides "that any Department or officer authorized to use the penalty envelopes may inclose them with return address to any person or persons from whom official information is desired, the same to be used only to cover such official information and indorsements relating thereto."

This provision would authorize the Chief Signal Officer or any officer of his corps charged with the duty of collecting such information, to request it to be furnished from a private citizen or person not an officer of the Government, and furnish him official envelopes properly addressed. But it confers no authority to furnish these penalty envelopes with no return address thereon to local agencies or officers of the Government, to be by them distributed to other subagencies or non-official persons. Such a use is not within the purview of the act as it now stands, and the most liberal rule of interpretation cannot extend it so far. An officer can furnish return envelopes with return address to any unofficial person from or through whom he desires official information, but he cannot furnish such unofficial person an unlimited supply of envelopes to be by him used in making inquiries, and collecting information upon the same subject, and to be furnished by him to other unofficial persons to correspond with him, so that he may compile the results of their information and send it to the Signal Office.

It may be very desirable, and for the public interest, to make all these matters relating to the weather service free of postage by extending to it the right to use all penalty envelopes that may be necessary in collecting information, but I am forced to the conclusion that the statute must be changed in order to confer the authority. Its present terms cannot be stretched so far.

These views are in harmony with several opinions furnished to this Department by the Attorney-General.

Very respectfully,

EDWIN E. BRYANT,
Assistant Attorney-General Post-Office Department.

Hon. WILLIAM F. VILAS,
Postmaster-General.

A true copy.

B. M. PURSSELL,
Second Lieutenant, Signal Corps, U. S. Army.

POST-OFFICE DEPARTMENT,
OFFICE OF THE POSTMASTER-GENERAL,
Washington, D. C., March 18, 1886.

SIR: Your communication of the 28th of January, in regard to the use by voluntary observers of penalty envelopes, was received by me but two days ago. In response thereto I transmit to you a copy of the opinion of the Assistant Attorney-General of this Department, from which you will see that the use of such envelopes as you inclosed a sample of, and the manner in which you speak of their being used, is illegal and cannot be permitted. The extent to which the law authorizes your office to send out envelopes is to afford the opportunity for reply to such inquiries as you may directly put, but it is en-

tirely inadmissible to place envelopes in the hands of unofficial persons to use at their discretion. In order to authorize the use of the envelope in the manner in which you desire it legislation should be secured.

Very respectfully,

WM. F. VILAS,
Postmaster-General.

Brig. Gen. W. B. HAZEN,
Chief Signal Officer, U. S. Army.

A true copy.

B. M. PURSSELL,
Second Lieutenant, Signal Corps, U. S. Army.

[H. R. 9896. In the House of Representatives, July 19, 1886. Read twice, referred to the Committee on the Post-Office and Post-Roads, and ordered to be printed.]

Mr. CALDWELL introduced the following bill:

A BILL authorizing the transmission of weather reports through the mails free of postage.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the provisions of the fifth and sixth sections of the act entitled "An act establishing post-roads, and for other purposes," approved March 3, 1877, for the transmission of official mail matter, be, and is hereby, extended to all observers and agents co-operating with the Signal Service in collecting meteorological reports for the benefit of commerce and agriculture; and that all official mail matter relating to weather reports may be transmitted through the mails free of postage, the envelopes containing said mail matter in all cases to bear an appropriate indorsement of the name and address of the observer from whom the same is transmitted, under the words "official business weather reports" with a statement of the penalty for their misuse.

[S. 2004. Forty-ninth Congress, first session. In the Senate of the United States, March 30, 1886.]

Mr. CONGER introduced the following bill; which was read twice, and referred to the Committee on Post-Offices and Post-Roads.

A BILL authorizing the transmission of weather reports, storm, and flood warnings, and the announcement of the approach of cold waves through the mails free of postage.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the provisions of the fifth and sixth sections of the act entitled "An act establishing post-roads, and for other purposes," approved March 3, 1877, for the transmission of official mail matter, be, and is hereby, extended to all observers and agents co-operating with the Signal Service in collecting meteorolgical reports for the benefit of commerce and agriculture; and that all official mail matter relating to weather reports, or containing warning of the approach of storms, floods, frosts, or cold waves may be transmitted through the mail free of postage; the envelopes containing said mail matter in all cases to bear an appropriate indorsement of the name and address of the observer from whom the same is transmitted, under the words "official business, weather reports," with a statement of the penalty for their misuse.

SIGNAL OFFICE, WAR DEPARTMENT,
Washington City, September 9, 1886.

The indications board will make a careful examination of the several systems of weather signals now in use, or proposed for use, in connection with the Signal Service, U. S. Army. The board will make a practical test of the various systems and will examine any reports on file in this office from persons who have had experience in the use of signals.

A report will be made on the relative merits of the several signal systems examined, with recommendations.

By order of the Acting Chief Signal Officer:

J. MITCHELL,
Second Lieutenant Signal Corps, U. S. A.

SIGNAL OFFICE, WAR DEPARTMENT,
Washington City, September 17, 1886.

SIR: I have the honor herewith to forward the report of the indications board on the several systems of weather signals in use or proposed for use. This report is made in

accordance with instructions received in Memorandum Order No. 233, office of Chief Signal Officer.

Very respectfully, your obedient servant,

H. H. C. DUNWOODY,
First Lieutenant, Fourth Artillery, Assistant, President of Board.

ACTING CHIEF SIGNAL OFFICER, *U. S. A.*

REPORT OF INDICATIONS BOARD ON THE SEVERAL SYSTEMS OF WEATHER SIGNALS IN USE OR PROPOSED FOR USE.

In accordance with instructions contained in Memorandum No. 233, office of Chief Signal Officer, the indications board has carefully considered the several systems of weather signals and made tests of visibility of the different systems under various conditions. These systems can all be classed under three general heads: (1) those employing symbols of differing color and shape displayed on a flag of uniform ground, as the weather signals now used by this service; (2) those employing flags of different colors, each flag being wholly of one color; (3) those employing solid symbols, depending for meaning on their shape, such as the "ball," "drum," "cone," system. The board found that even under the most favorable conditions the symbols of the first class were not visible to the naked eye at a distance exceeding 400 yards. Moreover, whenever the wind is light these flags hang in such a way that the symbol displayed thereon is not legible. Neither can they be read when one is directly to the windward of them.

None of these objections applied to the second system. The flags of this class tested were those used by the Alabama State Weather Service. These flags could be read at a much greater distance than those of the first class, and, as only the color need be seen to give their meaning, they were found to be legible when wrapped around the staff, and in all positions of the observer. These flags could be easily read with field glasses at a distance of two and a half miles, while the flags of the first class could not be distinguished, one from the other. Solid signals, the ball, drum, and cone, were also displayed, and were found to become illegible at about the same distance as the flags of the first class. These symbols were 20 inches in diameter. From observation of a ball 4 feet in diameter, at a distance of two miles and a half, it became evident that if solid symbols are employed they must be at least 4 feet in diameter in order to be visible at the same distance as the flags of the second class. This makes them too bulky and too expensive for general use.

The board therefore finds that, considering cost, convenience, and legibility, the best system of weather and temperature signals is one in which the several symbols are flags of solid colors, and, as the Alabama system is already in general use throughout the South, the board recommends that this system be adopted by the Signal Service on January 1, 1887, and that the system now in use be discarded on that date. The board further recommends that a circular letter be drawn up and sent to all interested in the display of weather and temperature signals, informing them of this change and the reasons therefor, and advising them to purchase the new flags as soon as those of the present system now in use shall become worn and unserviceable. In this way it is believed the change can be effected with the least trouble and expense. The Alabama system of signals is as follows:

Blue square flag: general rains.
Yellow square flag: local rains.
White square flag: fair weather.
Black pennant hoisted above weather flag: higher temperature.
Black pennant hoisted below weather flag: lower temperature.
Absence of pennant denotes no decided change in temperature.
The cold-wave flag at present is a white square flag with black center.

H. H. C. DUNWOODY,
First Lieutenant, Fourth Artillery, Assistant, President.

JOS. S. POWELL,
Second Lieutenant, Signal Corps, United States Army, Assistant.

JNO. P. FINLEY,
Second Lieutenant, Signal Corps, United States Army, Assistant.

J. E. MAXFIELD,
Second Lieutenant, Signal Corps, United States Army, Assistant, Recorder.

APPENDIX 4.

REPORT ON COLD-WAVE SIGNALS.

SIGNAL OFFICE, WAR DEPARTMENT,
Washington City, June 30, 1886.

To the CHIEF SIGNAL OFFICER OF THE ARMY, *Washington City:*

SIR: I have the honor to submit the following report upon the work performed in connection with the system of cold-wave warnings during the fiscal year ending June 30, 1886:

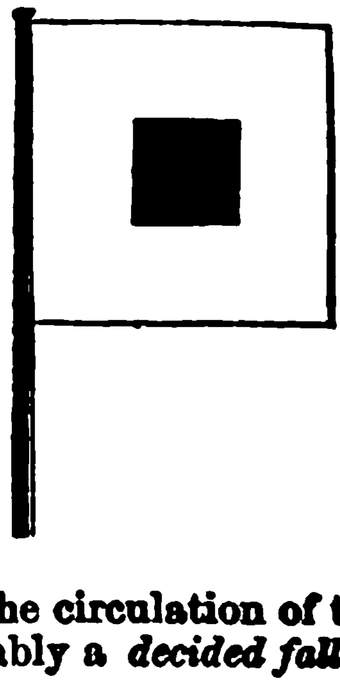
The progress made in this important and popular branch of meteorological work has been highly satisfactory, not only as regards the accuracy of predictions, but also in the greatly increased facilities for disseminating the warnings of the approach of cold waves.

The interest manifested by the general public and the expense incurred by a large number of citizens in the purchase and proper display of cold-wave signal flags sufficiently attest the value and importance of the system, and I have no hesitation in saying that, judging from the reports made by our observers during the year upon the benefits derived from the warnings and the prompt display of the signal, property to the value of many millions of dollars has been saved.

The unexpected arrival of sudden changes in temperature is always disastrous to the interests of persons engaged in agriculture and stock-farming, of shippers of perishable goods, manufacturers, railroad and canal companies, merchants, cotton and other planters; and the purpose of the Chief Signal Officer in sending out these warnings is that persons engaged in all industries liable to be affected by cold weather or sudden changes in temperature may be enabled to take the precautions necessary to protect their interests by being informed in ample time of the coming cold waves, which it is possible for the service to predict with an average accuracy of from 85 to 100 per cent.

When it is expected that the temperature will fall suddenly fifteen to thirty degrees or more in any section of the country, the cold-wave warning is immediately telegraphed to selected stations of the Signal Service, from twenty-four to forty-eight hours in advance, at which the cold-wave flags are immediately hoisted, in order that the public may be fully informed. The information is then sent by telephone and telegraph, whenever practicable, to all towns and railroad stations in the vicinity of the Signal Service stations displaying the signal.

Cold-wave signals are not ordered unless a temperature of forty-five degrees, or less, is expected. When the temperature is expected to fall twenty degrees, or more, in any district, and not reach forty-five degrees, announcement of *cool wave approaching* is made in the "indications." No signals are displayed for cool waves.



The cold-wave signal is a white flag, six or eight feet square, with black center about two feet square. It is lowered when the wave arrives.

A full description of the signal and the principal features of the system was published in the last annual report of the Chief Signal Officer.

In various studies upon the origin and movements of areas of high and low barometer it has been shown generally that they move almost invariably across the United States from west to east. The determination of the movement of the area of low barometer largely determines the movement of the following high barometer. Now, most of the areas of low barometer are formed in the region east of the Rocky Mountains, and as these areas move eastwardly the high moves in, and we have accompanying a *cold wave* of more or less intensity. Even if the low area pursue an abnormal track, the circulation of the winds about the high and low is such as to produce almost invariably a *decided fall in temperature* if the low be eastward of the high.

A careful investigation of the progressive motion of cold waves proves that they may be divided into three classes, as follows:

(1.) Those that move directly across the country from west to east, and which follow an almost invariable path along the chain of great lakes and across New England; these do not extend to the States south of the Ohio river.

(2.) Those which move in a southeasterly direction and cover the entire country in their progress.

(3.) Those which move southerly from Montana and Dakota to Texas, thence through the Gulf States, and then spread easterly over the Atlantic coast States. It sometimes occurs with this class that the cold wave is first felt at Saint Louis and Shreveport before being felt at Saint Paul and Chicago, and that then the cold wave takes the general movement eastward of the second class.

There are about 24 per cent. of cold waves of the first class, 54 per cent. of the second, and 22 per cent. of the third.

The following general results have been arrived at since the beginning of the study of the character and movement of cold waves in the United States:

(1) They appear in the extreme northwest, and about 86 per cent. originate or are first felt east of the Rocky Mountains, and 14 per cent. come across these mountains.

(2) Their appearance in the Northwest is independent of the time of day.

(3) By far the greatest number of cold waves travel across the country from Helena, Mont., to the Atlantic Ocean in thirty-two to forty hours.

(4) The most decided changes of temperature for the twenty-four hours occur in the afternoon, and this is particularly true of the sudden fall during the passage of a cold wave.

(5) The most decided and most severe cold waves follow severe storms.

(6) The maximum effect, that is, the minimum temperature, occurs when the barometer is the highest above the normal.

The following extracts from the reports of our observers indicate the value of this branch of Signal Service work. The reports cover the period from July 1, 1885, to June 30, 1886:

Abilene, Tex.—Total number of signals displayed, 13; justified, 11; not justified, 2. Warnings were considered by the business interests generally to be of considerable value. Principally beneficial to dealers in live stock and perishable goods. Business men put the utmost confidence in the warnings issued by the Chief Signal Officer. (L. R. 4605, Obs., 1886.)

Albany, N. Y.—Total number of signals displayed, 14; justified, 13; not justified, 1. Copies of warnings were furnished the Delaware and Hudson Canal Railroad Company; People's Line of Steamers; Schuyler Towing Line of Steamers; Hudson River Telephone Company; and State superintendent of canals. Fifteen or twenty towns received the warnings by these means. The Delaware and Hudson Canal Railroad Company are preparing symbols to be displayed on their cars, and, when completed, the warnings will be observed at ninety-one stations from Binghamton, N. Y., to Rutland, Vt., and Rouse's Point, N. Y.

This information was of great value to vessel interests, and the saving to dealers in fish, oysters, fruit, wine, &c., is incalculable. (L. R. 4543, Obs., 1886.)

Atlanta, Ga.—Total number of signals displayed, 13; justified, 10; not justified, 3. Warnings were furnished the Richmond and Danville Railroad; Georgia Pacific Railroad; Western and Atlantic Railroad; Central; and Atlanta and West Point Railroad. Estimated number of towns receiving benefits from the warnings is fifty. (L. R. 4542, Obs., 1886.)

Augusta, Ga.—Total number of signals displayed, 15; justified, 13; not justified, 2. Warnings furnished the following railroads: Augusta and Knoxville; Port Royal and Augusta; Gibson and Sandersville. At least twenty-two towns were immediately informed of the approach of cold waves. Merchants were especially benefited by the warnings. (L. R. 4993, Obs., 1886.)

Baltimore, Md.—Total number of signals displayed, 18; justified, 15; not justified, 3. Warnings were furnished the Corn Exchange, Merchants' Reading Room, Branch Hydrographic Office, Telephone Exchange, Baltimore and Ohio Railroad, and Baltimore and Ohio, Western Union, and United Lines Telegraph Companies. At least forty towns received the benefit of the warnings. The past winter was unusually severe, and as there are many interests here which are affected by sudden temperature changes a great deal of attention was paid to the warnings issued by the service. Shipping was benefited to the extent of many thousands of dollars. The shipments of perishable freight were also regulated by these warnings. When it is stated that upward of $12,000,000 are invested in the oyster-packing business, employing about 45,000 hands, some idea can be formed of the loss which would be sustained by forwarding at an inauspicious time

the product of only one day. Ten or more years ago the spoiling and sometimes the loss of entire shipments were frequent; during last winter but little complaint was heard in this direction. (L. R. 4539, Obs., 1886.)

Buffalo, N. Y.—Total number of signals displayed, 15; all justified. Warnings were furnished the following railroads: Rochester, Buffalo, and Pittsburg; Erie; Lake Shore; and the Grand Trunk; also the Western Union and Baltimore and Ohio Telegraph offices, and the Bell Telephone Exchange. It is estimated that about five hundred towns and cities received the benefit of the warnings. Prominent shippers of and dealers in grain and produce state that their business was conducted on the strength of our reports. There is no information sent out from the Signal Office that has given better satisfaction to the entire community. (L. R. 4570, Obs., 1886.)

Boston, Mass.—The total number of signals displayed, 16; all justified. Warnings were furnished the following railroads: Boston and Maine; Eastern; Boston and Lowell; Old Colony; New York and New England; Fitchburg; Boston and Albany; Boston and Providence; and the Boston, Revere Beach and Lynn. Over two hundred and seventy-five towns and stations received the benefit of the warnings. Managers of telephone exchanges in Worcester, Springfield, Fitchburg, North Adams, Orange, Northampton, and Palmer, Mass., Lebanon and Manchester, N. H., and Brattleborough, Vt., displayed cold-wave signals and forwarded the information to other cities. About fifty towns were furnished with the warnings in this manner. Many members of the Boston Fruit and Produce Exchange state that their shipments were regulated entirely by the temperature predictions. Fruit dealers always consulted this office before making a shipment. (L. R. 4818, Obs., 1886.)

Cairo, Ill.—Total number of signals displayed, 21; justified, 19; not justified, 2. Warnings were furnished the following railroads: Illinois Central; Mobile and Ohio; Texas and Saint Louis; Iron Mountain; Chicago, Vincennes and Cairo; and Cairo and Saint Louis. The officers of a number of steamboat lines consulted the warnings. Fifty-eight towns received the benefit of the warnings. This city being the point of call for all Ohio and Mississippi River steamers, the value of the warnings to the shipping interests of these rivers cannot be estimated. Shippers of perishable goods saved thousands of dollars by taking advantage of the information given. (L. R. 4568, Obs., 1886.)

Charleston, S. C.—Total number of signals displayed, 15; all justified. The officials of the South Carolina, Northeastern, and Charleston and Savannah Railroad Companies telegraphed the warnings to all stations on their respective roads, and about fifty towns received them. The amount of perishable goods saved by a single warning, that of January 8, 1886, was valued at $5,000. (L. R. 4612, Obs., 1886.)

Chicago, Ill.—Total number of signals displayed, 20; justified, 15; not justified, 5. Warnings were furnished the following railroads: Saint Paul, Minneapolis and Omaha; Chicago and Alton; Chicago and Eastern Illinois; Grand Trunk; Chicago, Rock Island and Pacific; Chicago and Northwestern; Lake Shore and Michigan Southern. Five hundred towns were, in all probability, supplied with cold-wave warnings through the medium of these railroads. This information was of special benefit to dealers in perishable goods, packers and shippers of fresh meat, brewers, and the railroads. (L. R. 4610, Obs., 1886.)

Cincinnati, Ohio.—Total number of signals displayed, 18; justified, 16; not justified, 2. Warnings were furnished eleven railroad companies. The signal of January 7, 1886, was the means of saving thousands of dollars. The general public placed great reliance in the predictions, and in every case made preparations accordingly. (L. R. 4606, Obs., 1886.)

Cleveland, Ohio.—Total number of signals displayed, 19; justified, 18; not justified, 1. Warnings were furnished the Lake Shore and Michigan Southern Railroad; New York, Chicago and Saint Louis Railroad; New York and Ohio Railroad; and Cleveland, Columbus, Cincinnati and Indianapolis Railroad. One hundred stations received the benefit of the information. (L. R. 4393, Obs., 1886.)

Columbus, Ohio.—Total number of signals displayed, 18; justified, 17; not justified, 1. Warnings were furnished the Sciota Valley Railroad; Columbus and Cincinnati Midland Railroad; Columbus, Hocking Valley and Toledo Railroad. Eighty-five stations received the benefit of the warnings. Cold-wave signal flags were displayed on the cars of the Columbus and Cincinnati Midland Railroad, Columbus, Hocking Valley and Toledo Railroad, and Cleveland, Mount Vernon and Delaware Railroad. (L. R. 4467, Obs., 1886.)

Des Moines, Iowa.—Total number of signals displayed, 20; justified, 17; not justified, 3. Warnings were furnished the Chicago, Rock Island and Pacific Railroad; Chicago and Northwestern Railroad; Osceola and Southern Railroad, and Wabash and Saint Louis Railroad. The information was distributed by the railroad companies and the Western

Union Telegraph Company to four hundred and forty-three points, comprising nearly all the important towns in Iowa. Large shipments of perishable goods were saved, and a loss of several thousand dollars prevented by means of these warnings. (L. R. 4672, Obs., 1886.)

Detroit, Mich.—Total number of signals displayed, 17; justified, 16; not justified, 1. The cold-wave signal was displayed by interested citizens in forty-seven leading cities in Michigan. The warnings were furnished sixty-four stations by the different railroad companies. No shipments of fruit, potatoes, or perishable articles were made during the progress of a cold wave, and an aggregate of $1,000,000 worth of property has been saved to shippers and citizens of Michigan by the timely warnings. (L. R. 4671, Obs., 1886.)

Grand Haven, Mich.—Total number of signals displayed, 14; justified, 9; not justified, 5. The signal was displayed by interested citizens in fourteen leading cities, and the information distributed to one hundred and thirty-two towns by the railroad companies. It is estimated that 41,000 persons engaged in farming, horticulture, &c., derived benefit from these warnings. (L. R. 4615, Obs., 1886.)

Jacksonville, Fla.—Total number of signals displayed, 15; justified, 14; not justified, 1. The railroad companies distributed the warnings to one hundred and fifteen towns in the State. They were of great benefit to the orange and vegetable growers. (L. R. 4544, Obs., 1886.)

Leavenworth, Kans.—Total number of signals displayed, 21; justified, 18; not justified, 3. The warnings were sent to one hundred and twenty-five towns through the co-operation of the railroads. A single display resulted in saving several car-loads of potatoes. (L. R. 4676, Obs., 1886.)

Memphis, Tenn.—Total number of signals displayed, 19; justified, 16; not justified, 3. Warnings were distributed by the railroads, telegraph, and telephone companies to two hundred and fifty-two towns. The information of approaching cold weather was of advantage in the care of crops and stock, and of perishable goods in houses, stores, and in transit; also in the protection of plants and water-pipes, in treating the sick, and in general matters of health. (L. R. 4710, Obs., 1886.)

Mobile, Ala.—Total number of signals displayed, 9; justified, 8; not justified, 1. Displays were highly appreciated and have been of great benefit. Mr. John G. Friend, secretary of the Mobile County Gardeners' Association, states that the cold-wave displays resulted in a saving to the gardeners in his county of $50,000. (L. R. 4613, Obs., 1886.)

Nashville, Tenn.—Total number of signals displayed, 18; justified, 16; not justified, 2. The warnings were distributed by the railroad, telegraph, and telephone companies to sixty-three towns. Signal flags were displayed at eleven points in Nashville and adjacent towns. The information was telephoned to fifty-seven merchants, farmers, stock-brokers, florists, and gardeners in Nashville and vicinity, and the warnings were bulletined at forty-two prominent points throughout the city. The information of approaching cold waves proved of untold value and benefit to farmers, stock-breeders, gardeners, florists, pork-packers, builders, factories, and to commercial interests generally; thousands of water-pipes were protected, cattle comfortably housed, and fruit and commission merchants saved their stock. Citizens spoke in the highest terms of the great benefits accruing from this branch of Signal Service work, and unprecedented demands have been made for the information from merchants and farmers living in the suburbs and surrounding towns. Not a single frost prediction failed during the season, nor did any frost occur which was unannounced. (L. R. 4714, Obs., 1886.)

New Orleans, La.—Total number of signals displayed, 13; justified, 10; not justified, 3. About ninety stations and towns received the benefit of the warnings through the railroad and telephone companies. The signal was displayed by interested citizens in eighteen towns in Louisiana. This information was of great benefit to sugar planters, and a single warning was given in time to save them thousands of dollars. The amount of property saved in this State during the season would carry on the entire frost-warning service for the next ten years. (L. R. 4574, Obs., 1886.)

New York City.—Total number of signals displayed, 17; justified, 16; not justified, 1. The warnings were furnished all the exchanges, clubs, prominent hotels, brokers, bankers, and others in New York City, Brooklyn, and Jersey City, and were bulletined in public places. It is estimated that 1,750,000 persons were thus informed of the approach of a cold wave. The warnings resulted in saving many thousands of dollars, and the cold-wave signal system is regarded by all classes as one of the most valuable features of the Signal Service, and, as the signals have been almost invariably justified, they have been universally heeded. The Foreign Fruit Exchange regulated much of their business by this information, and the members stated that the warnings have proved of incalculable benefit to them. (L. R. 4450, Obs., 1886.)

Philadelphia, Pa.—Total number of signals displayed, 18, justified, 14; not justified, 4. Over one hundred stations and towns received the warnings through the co-operation of the railroad, telephone, and telegraph companies. Merchants, fruit, and produce dealers were greatly benefited by this information. As affecting this community, the timely warning of approaching cold waves is the most valuable part of the practical work of the Signal Service. (L. R. 4616, Obs., 1886.)

Pittsburg, Pa.—Total number of signals displayed, 16; all justified. Fifty stations and towns received the warnings through the railroad and telegraph companies. Shippers of perishable goods and coal and river men were benefited, and the information was of incalculable value to dealers in grain, provisions, &c. (L. R. 4496, Obs., 1886.)

Saint Louis, Mo.—Total number of signals displayed, 21; justified, 18; not justified, 3. Warnings were distributed over the lines of seven railroads. The information was of inestimable value and indispensable during the winter season. (L. R. 4736, Obs., 1886.)

Saint Paul, Minn.—Total number of signals displayed, 20; justified, 11; not justified, 9. The warnings were distributed to two hundred and twenty-eight stations by the railroad companies. This information was of great benefit to railroads in enabling them to prepare for snow blockades and prevent delays caused by intense cold. Mr. H. C. Hope, superintendent telegraph, Chicago, Saint Paul, Minneapolis and Omaha Railroad, stated that the benefits to the railroads from a single warning were sufficient to pay the cost of the service for an entire year, and that this warning was undoubtedly the cause of saving several lives. Nothing connected with the service has proved so satisfactory to the public as the cold-wave system. (L. R. 4673, Obs., 1886.)

Toledo, Ohio.—Total number of signals displayed, 18; justified, 11; not justified, 7. Through the co-operation of the railroad, telegraph, and telephone companies the warnings were distributed to eight hundred and sixty-nine towns. The Ohio Central Railroad Company states that the warnings of December 9 and 23, 1885, and January 2, 16, and 19, 1886, enabled them to save $500 per night. The information was of great benefit to wholesale dealers in fruit and perishable goods. (L. R. 4545, Obs., 1886.)

List of stations of observation of the United States Signal Service at which the cold-wave signal is displayed and the warnings distributed for the information and benefit of the public.

Name of station.	Established.	Name of station.	Established.
Abilene, Tex	Dec. 21, 1886	Little Rock, Ark	May 17, 1884
Albany, N. Y	Mar. 22, 1884	Logansport, Ind	July 30, 1884
Atlanta, Ga	Nov. 6, 1884	Louisville, Ky	Dec. 26, 1883
Augusta, Ga.*	April 4, 1885	Lynchburg, Va.*	Apr. 4, 1885
Buffalo, N. Y	Mar. 8, 1884	Memphis, Tenn	Oct. 17, 1884
Boston, Mass	July 30, 1884	Milwaukee, Wis	Nov. 6, 1884
Baltimore, Md	Sept. 20, 1884	Mobile, Ala	Dec. 3, 1885
Chattanooga, Tenn	Mar. 21, 1884	Montgomery, Ala	Nov. 19, 1884
Cheyenne, Wyo	Oct. 2, 1885	Nashville, Tenn	Dec. 26, 1883
Chicago, Ill	Dec. 26, 1883	New York City	July 30, 1884
Cincinnati, Ohio	Dec. 26, 1883	New Haven, Conn	Nov. 6, 1884
Columbus, Ohio	July 23, 1884	New London, Conn.*	April 4, 1885
Concordia, Kans.*	A[illegible]85	New Orleans, La	Nov. 6, 1884
Cleveland, Ohio	N[illegible]84	Norfolk, Va.*	Apr. 4, 1885
Cairo, Ill	N[illegible]84	North Platte, Nebr	Oct. 2, 1885
Charlotte, N. C	J[illegible]85	Omaha, Nebr.*	Apr. 4, 1885
Charleston, S. C.*	A[illegible]85	Oswego, N. Y	Jan. 11, 1886
Des Moines, Iowa	J[illegible]84	Palestine, Tex	June 14, 1886
Detroit, Mich	J[illegible]84	Philadelphia, Pa	July 30, 1884
Davenport, Iowa	Nov. 6, 1884	Pittsburg, Pa	July 23, 1884
Denver, Colo.*	April 4, 1885	Portland, Me.*	Apr. 4, 1885
Dodge City, Kans.*	April 4, 1885	Rochester, N. Y	Nov. 6, 1884
Dubuque, Iowa*	April 4, 1885	Springfield, Ill	July 23, 1884
Erie, Pa	Sept. 11, 1885	Saint Louis, Mo	Dec. 26, 1883
Fort Smith, Ark	Apr. 13, 1886	Saint Paul, Minn.*	Apr. 4, 1885
Greencastle, Ind	July 23, 1884	Shreveport, La	Nov. 19, 1884
Galveston, Tex	Oct. 17, 1884	Sandusky, Ohio*	Apr. 4, 1885
Grand Haven, Mich.*	Apr. 4, 1885	Savannah, Ga	Apr. 4, 1885
Indianapolis, Ind	July 23, 1884	Sanford, Fla	Jan. 27, 1886
Jacksonville, Fla	Nov. 6, 1884	Toledo, Ohio	Nov. 6, 1884
Keokuk, Iowa	Nov. 6, 1884	Vicksburg, Miss.*	Apr. 4, 1885
Knoxville, Tenn.*	Apr. 4, 1885	Washington City	July 30, 1884
La Crosse, Wis	Jan. 20, 1886	Wilmington, N. C.*	Apr. 4, 1885
Lamar, Mo	Sept. 16, 1885	Yankton, Dak	Oct. 7, 1885
Leavenworth, Kans	July 30, 1884		

Total, [illegible].

Stations marked thus *, although established as cold-wave display stations on the dates given, did not go into operation until July 1, 1885.

List of cities at which the cold-wave signal is displayed, the warnings being telegraphed at the expense of the United States.

Name of city.	Signal Service station from which the warnings are telegraphed.	Name of city.	Signal Service station from which the warnings are telegraphed.
Abilene, Tex	Saint Louis, Mo.	Glasgow, Mo	Saint Louis, Mo.
Amelia C. H., Va	Lynchburg, Va.	Gloversville, N. Y	Albany, N. Y.
Amsterdam, N. Y	Albany, N. Y.	Greenville, Mich	Detroit, Mich.
Arrow Rock, Mo	Saint Louis, Mo.	Greenville, S. C	Atlanta, Ga.
Asbury Park, N. J	New York City.	Hannibal, Mo	Saint Louis, Mo.
Ashley, Ill	Saint Louis, Mo.	Harlan, Iowa	Des Moines, Iowa.
Auburn, Ala	Washington City.	Harper, Kans	Saint Louis, Mo.
Bainbridge, Ga	Savannah, Ga.	Hastings, Mich	Detroit, Mich.
Bath, Me	Portland, Me.	Hazelton, Ind	Indianapolis, Ind.
Beaver Dam, Wis	Milwaukee, Wis.	Helena, Ark	Memphis, Tenn.
Beloit, Kans	Saint Louis, Mo.	Hermann, Mo	Saint Louis, Mo.
Billings, Mo	Saint Louis, Mo.	Hoosick Falls, N. Y	Albany, N. Y.
Blair, Nebr	Omaha, Nebr.	Hopkinsville, Ky	Nashville, Tenn.
Bloomfield, N. J	New York City.	Hudson, N. Y	Albany, N. Y.
Bloomington, Ill	Chicago, Ill.	Huntington, W. Va	Cincinnati, Ohio.
Bolivar, Mo	Saint Louis, Mo.	Independence, Kans	Saint Louis, Mo.
Bonnieville, Ky	Louisville, Ky.	Iowa City, Iowa	Des Moines, Iowa.
Boonville, Mo	Saint Louis, Mo.	Jackson, Mo	Saint Louis, Mo.
Bordentown, N. J	Philadelphia, Pa.	Jacksonville, Ill	Saint Louis, Mo.
Boston, Ga	Savannah, Ga.	Johnstown, N. Y	Albany, N. Y.
Bridgeport, Ill	Saint Louis, Mo.	Joplin, Mo	Saint Louis, Mo.
Brownsville, Tenn	Memphis, Tenn.	Junction City, Kans	Saint Louis, Mo.
Brunswick, Mo	Saint Louis, Mo.	Kansas City, Mo	Saint Louis, Mo.
Bunker Hill, Ill	Saint Louis, Mo.	Kendallville, Ind	Chicago, Ill.
Burbank, Ohio	Cleveland, Ohio.	Kennett Square, Pa	Philadelphia, Pa.
Burkesville, Ky	Nashville, Tenn.	Kingston, N. Y	Albany, N. Y.
Butler, Ind	Chicago, Ill.	Kirksville, Mo	Saint Louis, Mo.
Caldwell, Kans	Saint Louis, Mo.	Lafayette, Ill	Chicago, Ill.
Cameron, Mo	Saint Louis, Mo.	La Grange, Ind	Chicago, Ill.
Canandaigua, N. Y	Rochester, N. Y.	La Porte, Ind	Chicago, Ill.
Canton, Mo	Saint Louis, Mo.	La Salle, Ill	Chicago, Ill.
Carterville, Mo	Saint Louis, Mo.	Latrobe, Pa	Pittsburg, Pa.
Carthage, Mo	Saint Louis, Mo.	Laury's Station, Pa	Philadelphia, Pa.
Catskill, N. Y	Albany, N. Y.	Leipsic, Ohio	Toledo, Ohio.
Cedar Rapids, Iowa	Des Moines, Iowa.	Ligonier, Ind	Chicago, Ill.
Centralia, Ill	Saint Louis, Mo.	Lindsey, Ohio	Toledo, Ohio.
Chambersburg, Pa	Washington City.	Louisiana, Mo	Saint Louis, Mo.
Champaign, Ill	Chicago, Ill.	Ludington, Mich	Detroit, Mich.
Charleston, Mo	Saint Louis, Mo.	Lyons, Iowa	Chicago, Ill.
Charleston, W. Va	Cincinnati, Ohio.	Madison, Ind	Indianapolis, Ind.
Charlottesville, Va	Lynchburg, Va.	Madison, Wis	Washington City.
Chetopa, Kans	Saint Louis, Mo.	Manchester, Ohio	Cincinnati, Ohio.
Chillicothe, Ill	Chicago, Ill.	Manchester, Tenn	Nashville, Tenn.
Circleville, Ohio	Cincinnati, Ohio.	Manhattan, Kans	Saint Louis, Mo.
Clay Centre, Kans	Saint Louis, Mo.	Manistique, Mich	Chicago, Ill.
Clayton, N. Y	Oswego, N. Y.	Marshall, Mo	Saint Louis, Mo.
Cobden, Ill	Saint Louis, Mo.	Maysville, Ky	Cincinnati, Ohio.
Columbia, Mo	Saint Louis, Mo.	McKeesport, Pa	Pittsburg, Pa.
Conneaut, Ohio	Erie, Pa.	Meadville, Pa	Pittsburg, Pa.
Corning, N. Y	Rochester, N. Y.	Melvin, Ill	Chicago, Ill.
Crawfordsville, Ind	Indianapolis, Ind.	Miami, Mo	Saint Louis, Mo.
Crete, Nebr	Omaha, Nebr.	Middletown, Va	Washington City.
Danville, Ill	Springfield, Ill.	Milan, Tenn	Memphis, Tenn.
Dayton, Ohio	Cincinnati, Ohio.	Minneapolis, Kans	Saint Louis, Mo.
Du Quoin, Ill	Saint Louis, Mo.	Moberly, Mo	Saint Louis, Mo.
Durham, N. C	Lynchburg, Va.	Montpelier, Ohio	Toledo, Ohio.
East Liverpool, Ohio	Pittsburg, Pa.	Montrose, Mo	Saint Louis, Mo.
East Tawas, Mich	Detroit, Mich.	Montrose, Pa	New York City.
Eaton, Ohio	Cincinnati, Ohio.	Mount Vernon, Ind	Indianapolis, Ind.
Edinborough, Pa	Erie, Pa.	Mount Vernon, N. Y	New York City.
Edwardsville, Ill	Saint Louis, Mo.	Neillsville, Wis	Milwaukee, Wis.
El Dorado, Kans	Saint Louis, Mo.	Nevada, Mo	Saint Louis, Mo.
Elk City, Kans	Saint Louis, Mo.	Newburg, N. Y	New York City.
Ellsworth, Kans	Saint Louis, Mo.	New Haven, Mo	Saint Louis, Mo.
Emmetsburg, Iowa	Des Moines, Iowa.	New Philadelphia, Ohio	Cleveland, Ohio.
Emporia, Kans	Saint Louis, Mo.	North Bangor, N. Y	Oswego, N. Y.
Fairbury, Nebr	Omaha, Nebr.	Northville, N. Y	Albany, N. Y.
Falls City, Nebr	Omaha, Nebr.	Odin, Ill	Saint Louis, Mo.
Findlay, Ohio	Toledo, Ohio.	Ogdensburg, N. Y	Oswego, N. Y.
Fond du Lac, Wis	Milwaukee, Wis.	Oil City, Pa	Pittsburg, Pa.
Franklin, Pa	Pittsburg, Pa.	Osage City, Kans	Saint Louis, Mo.
Fremont, Ohio	Toledo, Ohio.	Oshkosh, Wis	Milwaukee, Wis.
Fultonville, N. Y	Albany, N. Y.	Ottawa, Kans	Saint Louis, Mo.
Fort Atkinson, Wis	Milwaukee, Wis.	Owensborough, Ky	Louisville, Ky.
Galena, Kans	Saint Louis, Mo.	Oxford, Pa	Philadelphia, Pa.
Gallipolis, Ohio	Columbus, Ohio.	Oyster Bay, L. I	New York City.
Geneseo, Ill	Chicago, Ill.	Palatka, Fla	Jacksonville, Fla.
Gibson City, Ill	Chicago, Ill.		

List of cities at which the cold-wave signal is displayed, &c.—Continued.

Name of city.	Signal Service station from which the warnings are telegraphed.	Name of city.	Signal Service station from which the warnings are telegraphed.
Palmyra, Mo	Saint Louis, Mo.	Shelbyville, Ill	Saint Louis, Mo.
Pana, Ill	Saint Louis, Mo.	Southampton, N. Y	New York City.
Paris, Ill	Saint Louis, Mo.	South Bethlehem, Pa	New York City.
Parsons, Kans	Saint Louis, Mo.	Stanberry, Mo	Saint Louis, Mo.
Passaic, N. J	New York City.	Stevens Point, Wis	Milwaukee, Wis.
Paterson, N. J	New York City.	Tamalco, Ill	Saint Louis, Mo.
Peabody, Kans	Saint Louis, Mo.	Taylorville, Ill	Saint Louis, Mo.
Peoria, Ill	Chicago, Ill.	Terre Haute, Ind	Indianapolis, Ind.
Petersburg, Va	Washington City.	Texarkana, Tex	Shreveport, La.
Pierce City, Mo	Saint Louis, Mo.	Thomasville, Ga	Jacksonville, Fla.
Piqua, Ohio	Cincinnati, Ohio.	Tiffin, Ohio	Toledo, Ohio.
Potosi, Mo	Saint Louis, Mo.	Topeka, Kans	Saint Louis, Mo.
Princeton, Ind	Saint Louis, Mo.	Tracy City, Tenn	Nashville, Tenn.
Princeton, Ky	Louisville, Ky.	Trenton, N. J	Philadelphia, Pa.
Pulaski, Ill	Saint Louis, Mo.	Utica, N. Y	Albany, N. Y.
Pulaski, Tenn	Nashville, Tenn.	Valdosta, Ga	Savannah, Ga.
Quincy, Mich	Detroit, Mich.	Vandalia, Ill	Saint Louis, Mo.
Richmond, Ind	Indianapolis, Ind.	Vevay, Ind	Indianapolis, Ind.
Richmond, Mo	Saint Louis, Mo.	Villa Ridge, Ill	Saint Louis, Mo.
Richmond, Ky	Louisville, Ky.	Washington, Mo	Saint Louis, Mo.
Richmond, Va	Washington City.	Watseka, Ill	Chicago, Ill.
Ripley, Ohio	Cincinnati, Ohio.	Waynesborough, Va	Lynchburg, Va.
Rolla, Mo	Saint Louis, Mo.	Wellington, Kans	Saint Louis, Mo.
Ruff's Dale, Pa	Pittsburg, Pa.	West Grove, Pa	Philadelphia, Pa.
Russellville, Ky	Louisville, Ky.	West Liberty, Ohio	Sandusky, Ohio.
Saint Albans, Vt	Albany, N. Y.	Westminster, Md	Washington City.
Salem, N. C	Lynchburg, Va.	Weston, W. Va	Pittsburg, Pa.
Salina, Kans	Saint Louis, Mo.	Wilkes Barre, Pa	Philadelphia, Pa.
Sedalia, Mo	Saint Louis, Mo.	Wilmington, Del	Philadelphia, Pa.
Seneca Falls, N. Y	Rochester, N. Y.	Wilmington, Ohio	Cincinnati, Ohio.
Seneca, Kans	Saint Louis, Mo.	Woodbine, Iowa	Chicago, Ill.
Shamokin, Pa	Philadelphia, Pa.	Wooster, Ohio	Cleveland, Ohio.
Sharon, Pa	Pittsburg, Pa.	York, Pa	Washington City.

Total, 221.

Grand total of United States Signal Service stations and cities at which the cold-wave signal is displayed and warnings of approaching cold waves are telegraphed at the expense of the United States, 290.

In conclusion, I would state that information of the approach of each cold wave reaches fully 15,000,000 people through the display of the signal, the co-operation of railroad, telegraph, and telephone companies, and the publication of the warnings in all the leading newspapers of the country. It would be an endless task to attempt to enumerate all the benefits accruing to this large number of persons (very many of whom are engaged in business enterprises of great magnitude) by being forewarned from twenty-four to forty-eight hours of the approach of a sudden and decided fall in temperature. Sufficient data have been given in the body of this report to impress upon every one the importance and value of this work of the Signal Service, and it is hoped that future appropriations by Congress will be made upon such a liberal scale as will admit of the extension of this system to every town in the United States desirous of obtaining the information. Many citizens signified their willingness to purchase flags and display them at their own expense if the service would telegraph the warnings; but the appropriation available for this purpose during the past season was not sufficient to meet these demands.

I recommend that the sum of $5,000, to be expended in the extension of the system of cold-wave warnings, be added to the estimates for the fiscal year ending June 30, 1888, to defray cost of telegraphing the warnings to the large number of persons desiring them and who will co-operate with this service by displaying the cold-wave signal at their own expense.

Very respectfully, your obedient servant,

F. R. DAY,
Second Lieutenant, Signal Corps, U. S. Army.

APPENDIX 5.

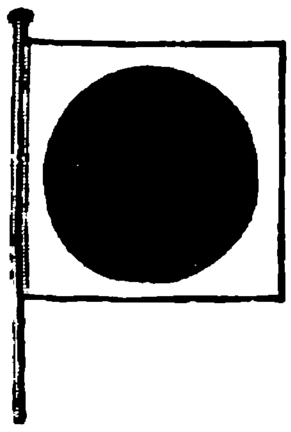
REPORT ON WEATHER AND TEMPERATURE SIGNALS.

SIGNAL OFFICE, WAR DEPARTMENT,
Washington City, June 30, 1886.

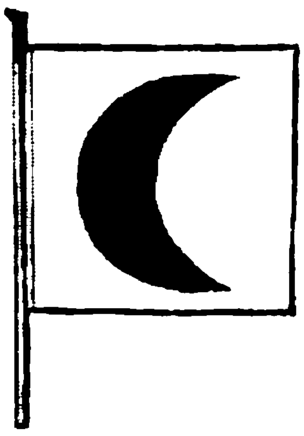
SIR: I have the honor to make the following report upon the work performed during the year ending June 30, 1886, in connection with the system of weather and temperature signals:

This system was inaugurated to meet the urgent demands of a very large number of persons in small cities for information of changes in weather and temperature.

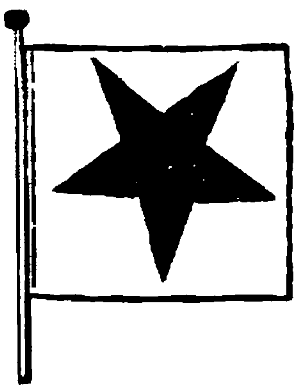
The signals consist of six flags, not less than 6 feet square, of the following colors:



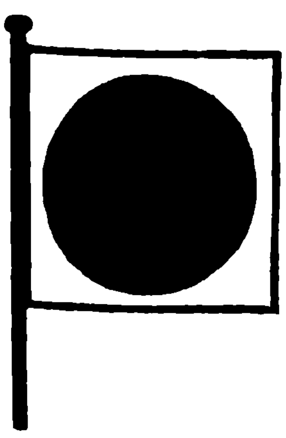
No. 1. White flag with large red sun in center, to indicate "higher temperature," or warmer weather.



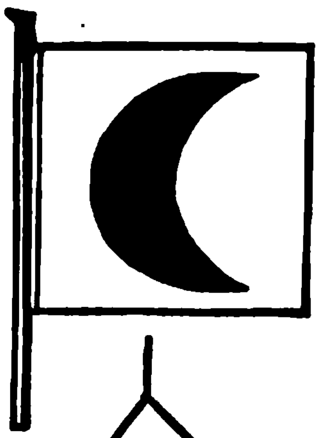
No. 2. White flag with red crescent in center, to indicate "lower temperature," or cooler weather.



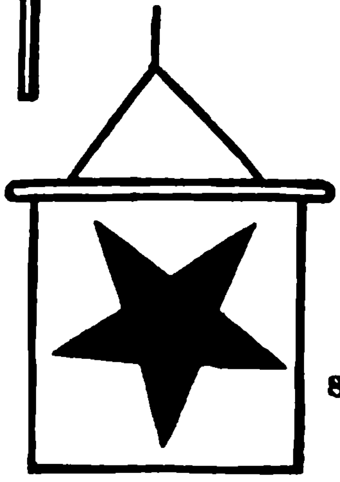
No. 3. White flag with red star in center, to indicate "stationary temperature."



No. 4. White flag with large blue sun in center, to indicate "general rain (or snow)."



No. 5. White flag with blue crescent in center, to indicate "clear or fair weather."



No. 6. White flag with blue star in center, to indicate "local rain (or snow)."

In displaying weather and temperature signals only two flags are hoisted at one time If more than one kind of weather or temperature is predicted, the last-named kind decides which flag to hoist.

The position of the flags in any hoist has no significance, as each flag designates a specific condition of weather or temperature in whatever position it may be placed.

During a calm, or when the wind is light, the signals cannot be readily distinguished if attached to the side of the staff, but when they are hung, as shown by the blue-star signal in the above cut, they are plainly visible during any velocity of wind.

The "indications" of the weather and temperature for the ensuing thirty-two hours are telegraphed daily by this office at 1 a. m., to stations of the Signal Service, and these "indications" are again telegraphed immediately by the observer to the towns within their respective districts, where the signals are displayed for the benefit of the public.

The telegrams are sent at the expense of the United States, but the flags are furnished by the persons by whom they are displayed. As a complete set of flags costs not less than $13, and as these signals are daily displayed at three hundred and fifteen towns throughout the United States by public-spirited citizens, who have assumed this expense, and who send the information to surrounding towns where signals are displayed, making not less than one thousand places at which the display is made, there is no further testimony needed to prove the popularity and utility of the system.

On May 20, 1886, the following letter was sent to each person who displays these signals:

"DEAR SIR: This office being desirous of obtaining your opinion as to the value to your citizens of the weather and temperature signals, with a view to making needed corrections or additions to this important work of the Signal Service, I have the honor to request that you will answer, as far as practicable, the following questions:

"(1) Do the signals, as displayed, give satisfaction?

"(2) Can the signals, as displayed, be readily distinguished?

"(3) Have complaints been made as to the meaning of the flags; that is, is their meaning perfectly intelligible?

"I should also be pleased to receive any suggestions as to any change which, in your view, would be an improvement; with the understanding, however, that no change will be made in the present system of symbols.

"I am, very respectfully, your obedient servant,

"W. B. HAZEN,

"*Brig. and Bvt. Maj. Gen., Chief Signal Officer, U. S. Army.*"

Two hundred and fifty replies were received to this communication, indicating that the weather and temperature signals give the greatest satisfaction to the inhabitants of the towns in which they are displayed. An example (given below) of the many letters received will serve to illustrate this fact:

"VEVAY, IND., *May* 25, 1886.

"Gen. W. B. HAZEN,

"*Chief Signal Officer, U. S. A.:*

"SIR: I have the honor to acknowledge the receipt of your esteemed communication of the 20th instant in regard to the opinion and value placed by the public on the daily display of the weather and temperature signals at this station.

"In reply, I have the pleasure to inform you that not only the citizens at this station, but also those in the adjacent parts of the county and the opposite Ohio River county of Carroll, Kentucky, regard the daily display of the signals of the highest benefit, and are unanimous in their praise of the 'astonishing fulfillment' of the predictions. The community watch with eager expectation every morning the display of the symbols and arrange their affairs accordingly. The merchants, mechanics, and farmers attest their fullest confidence in them, and rarely are they disappointed. During the past two stormy weeks much unnecessary work has been avoided by timely warning; indeed I can speak without hesitation of the universal confidence and appreciation by the public of this important branch of the Signal Service of the Army.

"In reply to the proposed questions, viz.:

"(1) Do the signals as displayed give satisfaction?—I have already answered in the affirmative in the introduction of this letter, but in addition would mention that even domestic duties are made dependent on the indications; there is scarcely a dwelling in this city without the symbol card and interpretation in a conspicuous place near the window commanding a view of the flag-staff.

"(2) Can the signals as displayed be readily distinguished?—Yes; they are visible in nearly every section of the city, suburbs, and shores on the Ohio River up and down stream; by the aid of a marine-glass or small telescope they appear plainly three miles back of the Ohio River in Kentucky, a privilege of which several prominent farmers avail themselves and impart the information to their neighbors; the captains of all passing steamers recognize the symbols.

"(3) Have complaints been made as to the meaning of the flags, that is, is their meaning perfectly intelligible?—No complaint has been heard from any source whatever; the system of the symbols; their decidedly distinct character—red for temperature, blue for weather, operate so perfectly and has become so familiar that a substitution of any other device would have a tendency to confuse and impair for some length of time the object for their display.

"The children in our public schools are as familiar with the symbols and their interpretation as they are with the alphabet.

"In my humble judgment any innovation in the present admirable code would, I fear, prove detrimental to the Signal Service of the Army.

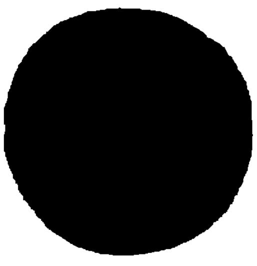
"I am, very respectfully, your obedient servant,

"CHAS. G. BOERNER,

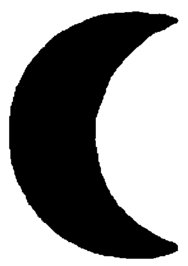
"*Observer.*"

In addition to the system of flag-signals, symbols of the same shape, color, and meaning are used by a number of railroad companies for display from the sides of baggage cars.

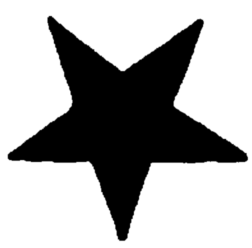
The railway weather and temperature signals consist of seven symbols for indicating the changes in the weather and temperature, as follows:



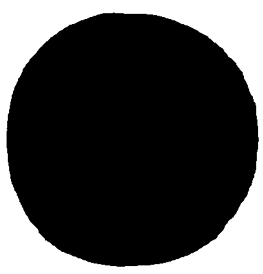
No. 1. Large red sun, to indicate "higher temperature," or warmer weather.



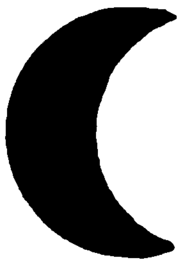
No. 2. Red crescent, to indicate "lower temperature," or colder weather.



No. 3. Red star, to indicate "stationary temperature."

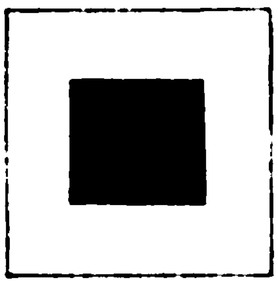


No. 4. Large blue sun, to indicate "general rain (or snow)."



No. 5. Blue crescent, to indicate "clear or fair weather."

No. 6. Blue star, to indicate "local rain (or snow)."



No. 7. Black square on white ground, to indicate the "approach of a cold wave."

The method adopted for the display of these symbols on railway trains is as follows:

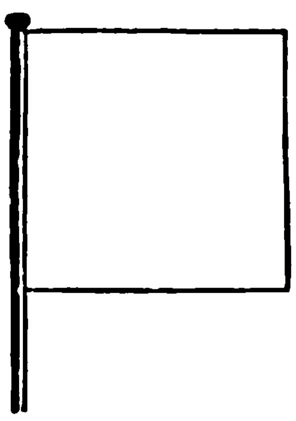
Seven tin, or sheet-iron, disks are made (in duplicate) each three feet square, and painted white. The proper symbols, as shown above, are painted on the disks, the symbol reaching to within six inches of the top and bottom. The disks are securely attached to each side of the baggage cars by means of cleats, or a slide, for holding three sides of the disk. These slides are long enough to admit two symbols, one above the other, one indicating the temperature and the other the weather. When warning is given of the approach of a cold wave, the cold-wave symbol takes the place of the temperature symbol.

The disks are in charge of the baggage-master, and he places them in position on the sides of the baggage cars when the "Indications" are received. They are changed at the expiration of each twenty-four hours.

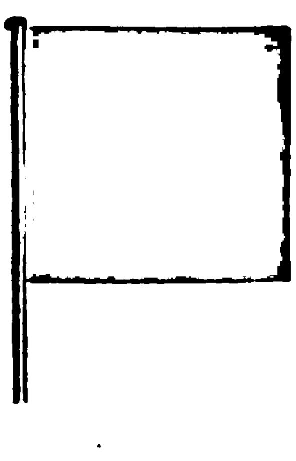
When the roads are long, running through two or more States, for each of which special predictions are made, the "Indications" are telegraphed by the railroad officials to selected points along the line of the road, and the symbols are changed by the baggage-masters to conform to the "Indications" for those States, respectively.

The system above outlined is simple and inexpensive. It is in successful operation on a number of railroads throughout the country, and is considered as being very effective in disseminating the information furnished by the United States Signal Service. A very large number of people receive the benefit of the weather forecasts in this way, who otherwise would not be able to obtain them.

The Alabama State Weather Service, which co-operates with the Signal Service, has adopted the system of weather and temperature signals given below. This system is very extensively used throughout the States of Alabama, Florida, Georgia, and Mississippi.

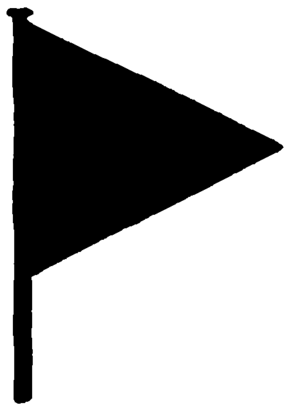


No. 1. White flag, indicates fair or clear weather.

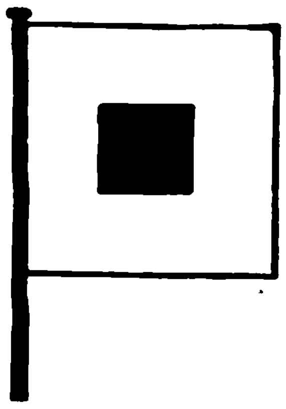


No. 2. Orange flag, indicates local rains.

No. 3. Blue flag, indicates general rains.



No. 4. Black triangular flag, refers always to temperature.



No. 5. (United States Signal Service Cold-Wave Signal) white flag with black square in center, indicates the approach of a cold wave, *i. e.*, a sudden and decided fall in temperature. This signal is usually ordered at least twenty-four hours in advance of the arrival of the cold-wave. It will not be displayed unless a temperature of forty-five degrees, or less, is expected.

Flag No. 4 (black triangular-shaped) by its position indicates the temperature to be expected. When displayed, it is either above or below the other flags. When placed above Nos. 1, 2, or 3 it indicates rising temperature, or warmer weather; when placed below flags Nos. 1, 2, or 3, as the case may be, it indicates falling temperature, or colder weather; its absence from the pole indicates stationary temperature (*i. e.*, no *material change* from the temperature of the previous day).

EXAMPLES OF DISPLAYS.

If "cooler, fair weather" is predicted, flags 1 and 4 are hoisted with No. 1 uppermost.

If "general rains and higher temperature" is predicted, then flags 3 and 4 are displayed, with No. 4 uppermost.

If "stationary temperature and general rains, followed by cooler, clear weather" is predicted, No. 3 is hoisted (with a space) and No. 1, with No. 4 below it.

When displayed on a flag-pole the signals are arranged so as to read downward.

The following is the list of towns at which the weather and temperature signals are displayed daily:

Towns.	Towns.	Towns.
Abilene, Kans.	Billings, Mo.	Carrollton, Mo.
Albany, N. Y.	Bloomfield, N. J.	Catskill, N. Y.
Allentown, Pa.	Blanchester, Ohio.	Carthage, Mo.
Arrow Rock, Mo.	Boonville, Mo.	Centralia, Ill.
Amsterdam, N. Y.	Bolivar, Mo.	Cedar Rapids, Iowa.
Asbury Park, N. J.	Bowling Green, Mo.	Champaign, Ill.
Ashland, Nebr.	Bordentown, N. J.	Chambersburg, Pa.
Ashley, Ill.	Brookings, Dak.	Charleston, W. Va.
Athens, Tenn.	Bridgeport, Ill.	Charleston, Mo.
Attica, Kans.	Brunswick, Mo.	Chester, Ill.
Auburn, Ala.	Brownsville, Tenn.	Charlottesville, Va.
Austin, Tex.	Burbank, Ohio.	Chillicothe, Ill.
Auburn, Ind.	Bunker Hill, Ill.	Chetopa, Kans.
Bath, Me.	Butler, Ind.	Circleville, Ohio.
Bainbridge, Ga.	Burkesville, Ky.	Chillicothe, Ohio.
Beaver Dam, Wis.	Cambridge, Ohio.	Clarksville, Tenn.
Beatrice, Nebr.	Caldwell, Kans.	Clarksburg, W. Va.
Bellevue, Ohio.	Canandaigua, N. Y.	Clayton, N. Y.
Belleville, Ill.	Cameron, Mo.	Clay Centre, Kans.
Bethlehem, Pa.	Canton, Ohio.	Clinton, Mo.
Beloit, Kans.	Canton, Mo.	Clinton, Iowa.
Blair, Nebr.	Carterville, Mo.	Collinsville, Ill.

Towns.	Towns.	Towns.
Cobden, Ill.	Johnston, N. Y.	Paris, Ill.
Columbia, Tenn.	Joplin, Mo.	Parkersburg, W. Va.
Columbia, Mo.	Junction City, Kans.	Parsons, Kans.
Columbus, Nebr.	Juniata, Nebr.	Passaic, N. J.
Columbus, Ind.	Kendallville, Ind.	Paterson, N. J.
Conneaut, Ohio.	Kennett Square, Pa.	Peabody, Kans.
Columbus, Ohio.	Kingston, N. Y.	Peoria, Ill.
Corning, N. Y.	Kirksville, Mo.	Pierce City, Mo.
Connellsville, Pa.	La Fayette, Ill.	Piqua, Ohio.
Coshocton, Ohio.	La Grange, Ind.	Pomeroy, Ohio.
Corsicana, Tex.	La Porte, Ind.	Pontiac, Mich.
Crawfordsville, Ind.	La Salle, Ill.	Portsmouth, Ohio.
Covington, Va.	Latrobe, Pa.	Princeton, Ind.
Covington, Ohio.	Laury's Station, Pa.	Princeton, Ky.
Crete, Nebr.	Lawrenceburg, Ind.	Pulaski, Ill.
Cumberland, Md.	Lawrence, Kans.	Quincy, Mich.
Dallas, Tex.	Lebanon, Mo.	Richmond, Ind.
Danville, Ill.	Leipsic, Ohio.	Richmond, Mo.
Dayton, Ohio.	Lexington, Ky.	Richmond, Ky.
Decatur, Ill.	Lexington, Tenn.	Ripley, Ohio.
Defiance, Ohio.	Lexington, Va.	Rochester, N. Y.
Denison, Tex.	Ligonier, Ind.	Ruff's Dale, Pa.
Du Quoin, Ill.	Lincoln, Nebr.	Russellville, Ky.
Durham, N. C.	Lindsey, Ohio.	Saint Albans, Vt.
East Liverpool, Ohio.	Loudon, Tenn.	Saint Clairsville, Ohio.
Eastman, Ga.	Louisville, Nebr.	Saint Joseph, Mo.
East Tawas, Mich.	Ludington, Mich.	Salem, N. C.
Eaton, Ohio.	Lyons, Iowa.	Salina, Kans.
Edinborough, Pa.	Madison, Ind.	Sarcoxie, Mo.
Edwardsville, Ill.	Malone, N. Y.	Sedalia, Mo.
El Dorado, Kans.	Manchester, Ohio.	Seneca Falls, N. Y.
Elk City, Kans.	Manistique, Mich.	Seneca, Kans.
Ellsworth, Kans.	Mansfield, Ohio.	Seymour, Ind.
Emmetsburg, Iowa.	Marietta, Ohio.	Shamokin, Pa.
Emporia, Kans.	Marshall, Mo.	Sharon, Pa.
Evansville, Ind.	Mattoon, Ill.	Shelbyville, Tenn.
Fairbury, Nebr.	Maysville, Ky.	Shreveport, La.
Fairfax, C. H., Va.	McConnellsville, Ohio.	Somerset, Pa.
Falls City, Nebr.	McKeesport, Pa.	Southampton, N. Y.
Fayetteville, Tenn.	Meadville, Pa.	Springfield, Tenn.
Findlay, Ohio.	Melvin, Ill.	Stanberry, Mo.
Fond du Lac, Wis.	Miami, Mo.	Staunton, Va.
Fort Atkinson, Wis.	Middletown, Va.	Steubenville, Ohio.
Fort Mason, Fla.	Milan, Tenn.	Steven's Point, Wis.
Fort Worth, Tex.	Minneapolis, Kans.	Stromsburg, Nebr.
Franklin, N. Y.	Minneapolis, Minn.	Syracuse, N. Y.
Fremont, Ohio.	Moberly, Mo.	Talladega, Ala.
Fultonham, Ohio.	Montpelier, Ohio.	Tamaloo, Ill.
Fultonville, N. Y.	Montrose, Mo.	Taylorville, Ill.
Gainesville, Tex.	Montrose, Pa.	Terre Haute, Ind.
Galena, Kans.	Morristown, Ohio.	Texarkana, Tex.
Gallatin, Tenn.	Mount Carmel, Ill.	Thomasville, Ga.
Gallipolis, Ohio.	Mount Pleasant, Pa.	Tidioute, Pa.
Garrett, Ind.	Mount Vernon, Ind.	Tiffin, Ohio.
Geneseo, Ill.	Mount Vernon, N. Y.	Topeka, Kans.
Geneva, Ohio.	Mount Vernon, Ohio.	Tracy City, Tenn.
Gibson City, Ill.	Murfreesborough, Tenn.	Trenton, N. J.
Gloversville, N. Y.	Nebraska City, Nebr.	Trenton, Tenn.
Grand Island, Nebr.	Neillsville, Wis.	Union City, Tenn.
Greenville, S. C.	Nevada, Mo.	Uniontown, Pa.
Hagerstown, Md.	Newark, N. J.	Urbana, Ohio.
Hamilton, Ohio.	Newburg, N. Y.	Utica, N. Y.
Hannibal, Mo.	Newcomerstown, Ohio.	Valdosta, Ga.
Harlan, Iowa.	New Haven, Mo.	Vandalia, Ill.
Harper, Kans.	New Middleton, Tenn.	Vevay, Ind.
Hastings, Mich.	New Philadelphia, Ohio.	Villa Ridge, Ill.
Hazleton, Ind.	New York City, N. Y.	Vincennes, Ind.
Helena, Ark.	Norristown, Pa.	Washington, Mo.
Hermann, Mo.	North Bangor, N. Y.	Washington, Pa.
Hillsborough, Ohio.	Northville, N. Y.	Watseka, Ill.
Hobart, N. Y.	Odin, Ill.	Wauseon, Ohio.
Hoosick Falls, N. Y.	Ogdensburg, N. Y.	Waynesborough, Va.
Hopkinsville, Ky.	Oil City, Pa.	West Grove, Pa.
Hudson, N. Y.	Olney, Ill.	West Liberty, Ohio.
Hutchinson, Kans.	Osage City, Kans.	Weston, W. Va.
Huntington, W. Va.	Oshkosh, Wis.	Wheeling, W. Va.
Independence, Kans.	Ottawa, Kans.	Wilkesbarre, Pa.
Iowa City, Iowa.	Owensborough, Ky.	Wilmington, Del.
Ironton, Ohio.	Oxford, Pa.	Wilmington, Ohio.
Jackson, Mo.	Oyster Bay, L. I.	Woodbine, Iowa.
Jackson, Tenn.	Paducah, Ky.	York, Nebr.
Jacksonville, Ill.	Palatka, Fla.	Youngstown, Ohio.
Jessup, Ga.	Palmyra, Mo.	Zanesville, Ohio.
Johnson City, Tenn.	Pana, Ill.	

Over 1,500 communications on the subject of weather and temperature signals have been received and acted upon by this office during the year, and the display of the signals has been established in 315 towns since July 1, 1885. It is believed that fully 300,000 cards, containing the symbols in colors, with an explanation of their meaning, have been circulated by private enterprise in the towns wherein the signals are displayed. In the city of Bloomington, Ill., alone 40,000 cards were thus issued.

It is estimated that several millions of people are daily informed of the coming changes in weather and temperature through the medium of these signals.

The success attending the introduction of the system and the progress made during the year in establishing points of display, together with the fact that large sums of money have been expended by interested citizens in the purchase of flags and in providing means for their proper display, indicate the great interest manifested by the public in this class of Signal Service work.

I recommend that the sum of $10,000 additional be included in the estimates for the fiscal year ending June 30, 1888, to pay the cost of telegraphing the "indications" to persons desirous of displaying these signals.

Very respectfully, your obedient servant,

F. R. DAY,
Second Lieutenant, Signal Corps, U. S. Army.

The CHIEF SIGNAL OFFICER OF THE ARMY,
Washington, D. C.

APPENDIX 6.

REPORT OF THE OFFICER IN CHARGE OF THE PACIFIC COAST DIVISION OF THE SIGNAL SERVICE.

SIGNAL OFFICE, DIVISION OF THE PACIFIC,
San Francisco, Cal., July 10, 1886.

SIR: I have the honor to submit as my annual report the following operations of the Pacific coast division of the Signal Service from July 1, 1885, to June 30, 1886:

The work of this division includes:

(1) Forecasts of weather for next thirty-two hours, from noon and 8 p. m., Pacific time, daily.

(2) Issuing of special bulletins at end of each month, giving a general synopsis of weather conditions and occurrences for the month then just past.

(3) Ordering cautionary signals at the designated ports from the northern to the southern boundary lines.

(4) Collection and dissemination of meteorological data of interest to the people of the Pacific coast States.

(5) Study of meteorology, especially of the Pacific coast, as will develop the work and science to its greatest useful application to commerce and agriculture.

(6) Practice of military signaling.

The *personnel* of the division is shown in the accompanying Table I. It will be seen therefrom that I have but two clerical assistants, and one is only with me part of the time. I most urgently recommend that some distribution of the clerical force be made so as to equalize the work between this and other divisions or stations. Any man who makes scientific meteorology a study must depend largely upon tabulated data, and such tabulation requires clerical work, and sufficient force should be available as will allow the assistant in charge to devote his time to study of methods by which results and the laws regulating them are to be found. He should be the architect and builder of a scientific structure, without being forced to waste his energies as a simple carpenter.

The office remains in the very central and convenient place in the Western Union Telegraph Building. Its removal to the rooms set apart for the Signal Service in the custom-house building, and the consolidation with the observer's office, which is now separate, was recommended during the year. Such change, while a removal from the center of the city, would be a measure of economy to the extent of $480 for rents alone per year when once effected. The service has at this place a creditable complement of furniture and facilities, making a good exhibit of Signal Service work. During the year and upon my request several self-registering instruments have been added to the display of the office, giving attraction and instruction to visitors.

It has been said that it could hardly be hoped that as successful weather forecasts could be made for the Pacific as for the Atlantic coast, owing to changes always coming from the west, we having no frontier of observations. Table II of percentages, appended, obtained by applying rigidly the usual rules, shows the result of the work for each month. It has been observed that weather areas work up and down the coast, and when established they continue with considerable permanence. A paper with charts has been prepared by me giving a review of the weather for the past year, and certain weather types illustrating this feature of Pacific coast climate. An examination of the table will reveal some peculiarities as to the result of prediction, the most striking being the high percentages during the nearly rainless months of the summer and occasionally during the winter, notably during February, 1886. Special predictions have been made for forty-eight and sometimes more hours in advance, but in such cases the charts have shown peculiar permanent types. Such predictions are regarded perfectly safe under the circumstances, and it is during such periods that much good can be done for coast vessels by foretelling weather and wind.

These predictions would supply a demand of commerce that the cautionary signal system does not reach, and the result is susceptible of study and verification from vessel reports and also from observations made by the light-house service on the coast line. It is also, however, found that predictions for thirty-two hours are sometimes guess-work, as

changes come so suddenly from an unobserved field, the ocean, that all view of the meteorological future is shut out. The element of winds on this coast is also an uncertain one, for topography and proximity to the ocean create as various winds as is the number of climatic districts; for instance, on the shore line sea breeze, in the Sacramento Valley southerly, in the San Joaquin Valley northerly winds blow at the same time. Such is the variety of locations and so constant are the winds at each that under a general prediction for a large area of country it is impossible oftentimes to include them; hence the advisability of prediction of wind in certain cases only. The prediction of changes in temperature appears uncertain and difficult on account of the absence of the successive march of high and low pressure areas, which are the usual phenomena that occasion such changes east of the Rocky Mountains.

Table III shows the distribution of the reports of this office, which includes all the important daily papers of this coast. A daily circulation of over 135,000 is shown.

The special monthly bulletin, giving a summary of temperature, monthly and seasonal rainfall, and other general notes, is issued, and published in the important papers of the State, and is a feature appreciated. This bulletin is deduced from data collected by telegraph from the Signal Service and railroad stations. A more complete system of reports for this purpose is not at the command of any other State in the Union. It was commenced in January.

The introduction of the cautionary signal system has been well received. Table IV shows the number of days in which storms occurred, days with or without signals, and number of days signals were displayed without any storm. This statement shows the value of the work much better than considering the justification of each signal. However, the number of signals ordered during the year was 47, of which 41 were justified, making a percentage of 87.2 by the usual method of verification. This is considering as not justified those orders to the Puget Sound ports from which no reports were received. It should be observed that for many storms included in the statement, they occur during the summer months, and are improperly called "northwest trades," and for which no benefit would come by ordering signals. The supply of anemometers and self-registers is recommended for Astoria, Port Townsend, Seattle, and Tacoma, to enable this office to ascertain by recorded velocities the value of displays at Puget Sound ports.

As the experience gained by the assistant in charge of this division enables him to order signals with greater surety of success, and the service becomes better recognized thereby, new points of display should be added. The only place at present where an additional display station might be well established is at Port Harford—the port of San Luis Obispo. On account of San Luis Obispo office being burned April 19, I would advise the location of the new office at Port Harford, because of the signal display that might be made in connection with it there; besides, for climatological purposes, there are voluntary observers at San Luis Obispo that fill every requisite. Another station would be of much service in the interior, near Lake Tulare.

As illustrating the work of the office and its advance, the accompanying Table V shows how many letters were received and sent; also number and kind of meteorological reports received. The apparent falling off during the months of May and June is largely due to the absence of rainfall, and which many voluntary observers consider the only element worthy of report. This statement covers only the current reports collected.

This division has collected and, since December, tabulated the rainfall from over two hundred stations, including voluntary, railroad, post surgeon, and Signal Service observations. About the middle of each month, when all the reports have been received by mail, a tabulated statement has been issued and published by the papers, which has been favorably received. This State having so great a dependence upon the cereals, whose produce is largely governed by the amount and distribution of rain, its people watch closely and receive with interest any matter that advances knowledge of this kind.

These monthly summaries were included in an annual statement prepared by this office, and published by the Commercial News July 1, 1886, showing the average rainfall for each month of the year from about two hundred stations. This table did not, however, include many of the recently established places of observation and reports collected since June 30, which, if included, would swell the aggregate to about three hundred. To bring before the public this valuable data I have charted it nearly to completion, and should it be desired it can be printed, thus giving the Signal Service credit for the most complete publication of rainfall data ever collected for any single region in the United States.

A statement of the expenses during the year, exclusive of salaries, stationery, &c., is shown in Table VI. The economy practiced is evident, the telephone, post-office box, and janitor's services being discontinued. Economy has also been made by discontinuing from May to October certain telegraphic reports which, owing to location and uniformity of climate during the summer season, are not so essential as in winter. The

scope of country covered by telegraphic reports received at this office and the manner of charting the same is shown by the four charts of 7 a. m., January 20, 1886. The severity of storms and the rapid fluctuations that sometimes occur on the Pacific coast may be gained from an examination of these charts and the consideration that a little over twenty-four hours after but two isobars could be traced on the chart from Vancouver to Mexico.

Scientific inquiry tending to the advancement of meteorology has thus far given way to the study of prediction of weather, which is deemed of first importance owing to its practical bearing, and the main object of the establishment of this division, however, besides the work of preparation of precipitation charts and tables, it is hoped during the summer to be able to collect data regarding and to discuss the "northers" of California, cause of low summer pressure in the interior, the advance of the rainy season along the coast, and frost and floods.

The subject of army signaling has not received attention, except a slight amount of office practice. Some failure to meet my requisition for the necessary signal equipments has operated to drop this work into neglect. It was intended during the long series of favorable summer days to practice occasionally as a means of out-door recreation.

It is sincerely hoped that the wishes expressed to me verbally by the Chief Signal Officer when I was ordered to this new and untried field of duty have been fully carried out and his expectations realized. Your expressed confidence in my ability and fitness to build up the Pacific coast division has given zest to my efforts, and I feel assured by the absence of any criticism, letters of instruction, or suggestion, that I have fully met with your approbation.

The following extensions of the work would be of benefit to the interests of the Pacific coast, and in direct connection with its work; (*a*) study of the climate so as to insure a satisfactory warning of frosts; (*b*) the study of data looking to the establishment of such stations for the reporting of excessive rainfalls and sudden rises in the affluents of the great California rivers as to insure good results in forewarning overflows and floods, a thing now said to be impracticable; (*c*) the bringing into harmony with and use of the service of the meteorological system of the railroads which receive telegraphic reports daily from stations between El Paso, Tex., and the northern California line; (*d*) the establishment of stations for reporting tri-daily, located in the San Joaquin Valley, and at Port Harford; (*e*) the display of signals for the fishery interests at the mouth of the Columbia River; (*f*) the organization of a State weather service in co-operation with the Pacific division of the weather bureau for the extension and publication of valuable observations; (*g*) the correction of the exposure of many of the instruments which are now faulty; (*h*) extension of the cautionary signal system at smaller ports on the Pacific coast; (*i*) the extension of the prediction work to benefit vessels sailing along the coast; (*j*) establishment of a few stations in British Columbia along the line of the Canadian Pacific Railroad.

Respectfully submitted.

W. A. GLASSFORD,
Second Lieutenant, Signal Corps, U. S. Army, Assistant in Charge.

The CHIEF SIGNAL OFFICER OF THE ARMY,
Washington, D. C.

TABLE I.—*Statement showing names of persons on duty in connection with the Pacific Coast Division, rank, date, and nature of work.*

Name.	Rank.	Date.	Order.	Remarks.
Robert Craig	1st Lt., 4th Art'y	July 1, 1885, to Sept. 30, 1885.	Nos. 2 and 205, A. G. O., 1885.	In charge.
W. A. Glassford*	2d Lt., Sig. Corps	Dec. 23, 1885, to June 30, 1886.	No. 279, A. G. O., 1885	In charge.
Nelson Gorom	Sgt., Sig. Corps	Oct. 1, 1885, to Dec. 23, 1885.	Letter O. C. S. O., Sept 10, 1885.	In charge.
S. Applegate	do	Apr. 26, 1886, to May 6, 1886.	S. O. 36, 1886, order of Sergeant Gorom.	Clerical assistant.
A. P. Leavitt	do	July 10, 1885, to May 18, 1886.	Letter O. C. S. O., July 10, 1885.	Clerical assistant.
B. S. Pague	Private, S. Corps	Aug. 10, 1885, to May 18, 1886.	S. O. 9, 50, and 44, 1886	Clerical assistant.
G. A. Riviere*	do	July 1, 1885, to June 30, 1886.	S. O. 9, 1885	Clerical assistant.
Nelson Gorom*	Sgt., Sig. Corps	May 18, 1886, to June 30, 1886.	Letter O. C. S. O. May 8, 1886.	Clerical assistant part of each day.

*On duty on June 30, 1886.

TABLE II.—*Percentage of verification of weather predictions.*

	North Pacific.			Middle Pacific.			South Pacific.				
	Weather.	Wind.	Temperature.	Weather.	Wind.	Temperature.	Weather.	Wind.	Temperature.	Average.	Person predicting.
1885.											
July	85.5	96.1	83.8	96.5	98.2	81.6	99.1	97.8	89.5	92.0	Lieut. Robert Craig, assistant, July 1 to September 25, 1885.
Aug	94.7	97.8	81.6	100.0	98.2	75.4	95.6	97.8	87.7	92.1	
Sept	78.1	86.2	82.6	97.8	93.3	78.6	100.0	94.6	86.2	88.5	
Oct	80.6	62.9	57.3	92.2	70.7	79.3	97.4	90.0	86.6	79.7	Sgt. N. Gorom, Sept. 25 to Dec. 23, 1885, except suspended from Nov. 28 to Dec. 2.
Nov	82.4	73.0	58.4	75.3	70.1	70.0	77.0	68.6	84.8	73.4	
Dec	75.9	70.9	64.5	81.4	68.6	82.3	88.2	73.2	76.9	75.8	
1886.											
Jan	87.5	80.1	63.0	84.3	69.0	71.8	79.8	81.3	78.4	77.2	
Feb	77.9	86.1	77.9	91.8	75.0	90.4	89.4	90.9	88.0	85.2	
March	86.6	84.5	78.0	72.8	63.4	86.0	87.5	84.1	81.5	79.3	
April	86.2	87.2	83.0	87.1	69.2	85.7	95.8	86.2	80.8	84.3	
May	92.1	89.0	79.4	91.7	73.7	82.9	100.0	96.1	81.1	87.3	
June	80.4	86.2	71.4	99.6	86.6	75.9	99.1	93.3	83.1	86.2	
Average	84.0	83.6	73.6	81.5	78.0	79.9	92.2	89.5	83.7	83.4	

TABLE III.—*Table showing the distribution of the weather forecasts on the Pacific coast.*

Number of manifold bulletins.	Paper or person receiving indications.	Place.	Circulation.	Remarks.
1	Evening Bulletin	San Francisco	7,500	Synopsis and indications complete.
1	Abend Post*	do	2,500	Indications for California during rainy season.
1	Evening Post	do	12,500	Do.
1	Daily Report*	do		Indications for California.
1	San Francisco Chronicle†	do	37,500	Do.
1	Morning Call	do	25,000	Do.
1	Alta California†	do	12,500	Synopsis and indications complete.
1	Daily Examiner†	do	10,000	Indications for California during rainy season.
1	Der Demokrat†	do	3,000	Weather and temperature for California during rainy season.
1	Le Courrier de San Francisco.†	do	1,500	Indications for California during rainy season.
1	The Guide†	do		Indications of weather.
1	Commercial News†	do		Indications Pacific coast.
1	Journal of Commerce†	do	750	Do.
1	Observer's office	do	146	Complete farmers' bulletin printed and mailed.
1	Western Union Telegraph Company.	do	1	Posted on bulletin board.
1	Associated Press	do		Telegraphed to papers and places named.
	Surf	Santa Cruz		Indications of weather.
	Press	Santa Barbara	500	Do.
	Independent	do	500	Do.
	Mercury	San José	3,000	Do.
	Independent	Stockton	1,500	Do.
	Herald	Los Angeles	1,000	Do.
	Times	do	2,000	Do.
	Express	do	1,500	Do.
	Sun	San Diego	250	Do.
	San Diegan	do		Do.
	Union	do	1,000	Do.
	Record Union	Sacramento	4,000	Do.
	News	Modesto	500	Do.
	Expositor	Fresno	250	Do.
	Morning Oregonian	Portland	4,000	Do.
	Ledger	Tacoma	500	Do.
	News	do	500	Do.
	Chronicle	Seattle	500	Do.
	Post-Intelligencer	do	1,000	Do.
	Total		135,397	

* Evening. † Morning.

TABLE IV.—*Table showing the number of days storms occurred at each station, with the number of cautionary signals displayed, &c.*

1885–'86.	San Diego.				San Francisco.				Fort Canby.				Astoria.				Olympia.			
Month.	Number.	With signals.	Without signals.	Signals without storm.	Number.	With signals.	Without signals.	Signals without storm.	Number.	With signals.	Without signals.	Signals without storm.	Number.	With signals.	Without signals.	Signals without storm.	Number.	With signals.	Without signals.	Signals without storm.
July					15		15		2		2									
August					18		18													
September					15		15		7		7		1		1					
October					3		3		9		9		1		1					
November					3		3		23		23		9		2		2		2	
December									20		20									
January	1		1		7	5	2		17	10	7	3	11	10	1	3				
February					1		1		13	3	10			4	1					
March	1		1		2		2		13		13		3		3					
April	2		2		3		3		7	1	6		2	1	1					
May	2		2		1		1		1		1		1		1		1		1	
June					7		7										3		3	
Total	6		6		75	5	70		112	14	98	3	26	15	11	3	6		6	

1885–'86.	Tacoma.				Seattle.				Port Townsend.				Port Angeles.			
Month.	Number.	With signals.	Without signals.	Signals without storm.	Number.	With signals.	Without signals.	Signals without storm.	Number.	With signals.	Without signals.	Signals without storm.	Number.	With signals.	Without signals.	Signals without storm.
July																
August																
September																
October																
November																
December																
January	1	1		2	1	1		2	3	3			11	9	2	1
February	1	1						1	1	1			2	1	1	
March																
April				1				1	1	1			3	2	1	
May																
June													1		1	
Total	2	2		3	2	1		4	5	5			17	12	5	1

NOTE.—From July 1 to April 30 a velocity of 25 miles per hour is considered as a storm, and since May 1 the verifying velocities at different stations have been used, *i. e.*, San Diego, 20 miles; San Francisco, 30 miles; Fort Canby, 35 miles; Olympia, 13 miles, and Port Angeles, 21 miles. Astoria, Tacoma, Seattle, and Port Townsend have no anemometers.

TABLE V.—*Showing letters sent and received, meteorological forms from Signal Service, surgeons, railroad and voluntary observers.*

1885–'86.	Letters.		Meteorological reports received.				
Months.	Received.	Sent.	Signal Service.	Voluntary Observers.	S. P. R. R. C.	Post surgeon.	Light-House Department.
July	143	143	63	4	121	11	....
August	123	185	62	7	121	13	....
September	109	183	63	12	121	11	....
October	73	68	61	10	122	10	....
November	29	36	63	24	124	10	....
December	25	35	58	23	126	10	8
January	33	36	63	34	128	11	8
February	57	116	64	24	128	12	8
March	50	85	64	70	127	12	8
April	69	313	59	67	127	12	8
May	49	109	58	40	123	12	8
June*	33	84	43	26	115	12	8
Total	793	1,387	715	360	1,483	135	56

* Reports received to July 10.

TABLE VI.—*Annual expenses at branch signal office, division of the Pacific, during fiscal year ending June* 30, 1886.

Items of expense.	Amount.	Remarks.
Rent, office	$240 00	$20 per month.
Washing towels	6 00	50 cents per month.
Gas fixtures and chimneys	26 50	
Rent of telephone	42 00	$6 per month, from May 4, 1885, to March 31, 1886.
Office cleaner	48 00	$6 per month, from July 1, 1885, to February 28, 1886.
Rent of post-office box	9 00	$3 per quarter, from July 1, 1885, to March 31, 1886.
Gas for office	14 70	
Coal and kindling wood	24 00	
Office supplies	13 65	Soap, ink (red), copying ink, stamps, oil, lamps.
Total	423 85	

Table showing monthly rainfall averages (expressed in inches and hundredths) in California, Oregon, and Washington Territory, with mean averages for season, number of years from which averages are determined, and total for season of 1885 *and* 1886.

[Compiled by Lieut. W. A. Glassford, Signal Corps, U. S. A., in charge Pacific Coast Division.]

† Trace.

Table showing monthly rainfall averages, &c.—Continued.

* Trace.

Total showing monthly rainfall averages, &c.—Continued.

* Trace.

Total showing monthly rainfall averages, &c.—Continued.

*Trace.

APPENDIX 7.

REPORT UPON THE SYSTEM OF COTTON-REGION OBSERVATIONS.

SIGNAL OFFICE, WAR DEPARTMENT,
Washington City, June 30, 1886.

SIR: I have the honor to submit my annual report of the work done in connection with the system of cotton-region reports for the year ending June 30, 1886.

The system continued in active operation from July 1 to October 31, after which observations were discontinued for the year. The appropriation being insufficient to carry on the observations and reports during the period contemplated and desired by cotton interests, the resumption of the service in the spring was delayed until April 10. The information is given the widest publicity throughout the cotton-growing States by being bulletined daily at prominent points and published in the newspapers, the editors allowing ample space for the purpose. Copies are also sent to the cotton exchanges, boards of trade, &c. The producer, the shipper, and others interested in the growing crop have, in their correspondence with this office, uniformly testified to the great benefits derived from the careful study of the reports, which contain the mean maximum and mean minimum temperatures and the rainfall at over one hundred and fifty places in the cotton districts.

This branch of the service has, since its inception, labored under many disadvantages, resulting from insufficiency of money for its proper maintenance, which rendered it impossible to establish the necessary number of points of observation over the wide area of country which it was the desire of this office to benefit by the reports; and also the fact that no money being appropriated by Congress for telegraphing the observations, the generosity of the various railroad companies and telegraph lines had to be depended upon for the free transmission of the messages, which proved a very unsatisfactory arrangement.

The pay of the special observers employed, being but 20 cents per day, offers small inducement to take and forward reports with that care and promptness which they should receive in order to make them thoroughly reliable and of the greatest value to all.

The transmission of the observations over the telegraph lines under the circumstances just stated can be easily slighted, and this office has no alternative but to accept any explanation that may be given. The difficulties named can be readily obviated if the estimates submitted to Congress are favorably acted upon. Provision has been made in these for 1886–'87 for a total of 250 stations; for the increase of pay of the special observers to 50 cents per report, and the payment by the Government of the necessary telegraph tolls from the special stations to the section headquarters.

Before the cotton season opened in April last it was decided that observers in charge of the section centers should visit and inspect each of the special stations; and this has since been done, and much good in the way of better service, greater accuracy and promptness in rendering reports has resulted. Many of these stations had never before been visited by a representative of the Signal Service. Each inspector was charged to investigate and correct all the irregularities; to properly instruct the observers; to inspect the condition of the Government property on hand, and recommend such action as seemed necessary.

The following cotton-region stations were inspected by the observer in charge of the section center:

Sergeant S. W. Beall, Atlanta, Ga., visited Gainesville and Toccoa, Ga.; Anderson, Greenville, and Spartanburg, S. C.; Griffin, Newnan, West Point, and Cartersville, Ga.

Sergeant David Fisher, Augusta, Ga., visited Batesburg, Columbia, Chester, and Greenwood, S. C.; Blackville, S. C.; Waynesborough, Ga.; Allendale, S. C.; Camack, Washington, Union Point, and Athens, Ga.

Sergeant J. H. Smith, Charleston, S. C., visited Saint George's, Branchville, Saint Matthew's, Jacksonborough, Yemassee, Hardeeville, and Kingstree, S. C.

Sergeant E. O'C. MacInerney, Galveston, Tex., visited Houston, Columbia, Cuero, Weimar, Luling, Austin, Brenham, Hearne, Waco, Belton, Corsicana, Dallas, Weatherford, Tyler, Longview, Huntsville, Sour Lake, and Orange, Tex.

Sergeant B. L. Goulding, Little Rock, Ark., visited Devall's Bluff, Brinkley, Kensett, Newport, Madison, Helena, Arkansas City, Monticello, Pine Bluff, Magnolia, and Texarkana, Ark.; Paris, Tex.; Prescott, Malvern, and Russellville, Ark.

Sergeant D. T. Flannery, Memphis, Tenn., visited Grand Junction, Tenn.; Corinth, Miss.; Tuscumbia, Decatur, and Scottsborough, Ala.; Holly Springs, Oxford, Grenada, Batesville, and Hernando, Miss.; Covington, Dyersburg, Milan, Paris, Bolivar, Brownsville, and Arlington, Tenn.

Sergeant Appleton Pritchard, Mobile, Ala., visited Waynesborough, and Meridian, Miss.; Livingston, Ala.; Macon, Columbus, Aberdeen, and Okolona, Miss.

Sergeant Lawrence Dunne, Montgomery, Ala., visited Fort Deposit, Greenville, Evergreen, Selma, Pine Apple, Marion, Calera, Birmingham, Opelika, Ala.; Columbus, Ga.; and Enfaula, Ala.

...er Herman, New Orleans, La., visited Amite City, La.; Brookhaven, ...rt Gibson, and Natchez, Miss.; Alexandria, Natchitoches, Coushatta ... Cheneyville, Opelousas, and Lafayette, La.

... Emery, Savannah, Ga., visited Jesup, Eastman, Macon, Smithville, ...lbany, Thomasville, Bainbridge, and Quitman, Ga.; Live Oak, Waldo, ..., Fla.; Way Cross, Allapaha, and Millen, Ga.

...V. Byram, Vicksburg, Miss., visited Edwards, Jackson, Lake, Miss., and

... Mitchell, stationed at Smithville, N. C., was detached and visited Goldsborough, New-Berne, Weldon, Raleigh, Salisbury, and Wadesborough, N. C.; Cheraw and Florence, S. C.; and Lamberton, N. C.

Full and complete instructions for the guidance of cotton-region observers were prepared in pamphlet form, and copies were furnished by the inspectors to each special observer in charge of a special cotton-region station.

These instructions are in such complete form that in the event of any change being necessary, the newly-appointed observer could easily familiarize himself with the requirements of the position.

The result of these inspections was very satisfactory; and all instruments are now properly exposed, and the instrument shelters located in the best positions obtainable.

Heretofore the instrument shelters at nearly all stations have been located on or near the depot or freight building; but as the constant jarring caused by passing trains had a tendency to lower the index point of the minimum thermometers the inspectors were instructed to remove all shelters liable to be thus affected, and have them set up in more advantageous positions. The rain-gauges at all the special stations have also been examined, and where the exposure was considered defective better localities have been secured.

The special cotton-region observers have been personally instructed in their duties, and, as far as the money appropriated for its support will permit, the cotton-region service is now in the most effective condition possible.

There are now in operation twelve centers for collecting the reports, eight regular Signal Service stations taking cotton-region observations, and one hundred and thirty-five special cotton-region stations, making one hundred and fifty-five places in all at which these observations are made and reported.

The following stations were established during the year:

Brenham, Tex. (Galveston, Tex., center); Nebo and Forrest City, Ark. (Little Rock, Ark., center); and the following stations were discontinued: Beaumont, Tex. (Galveston, Tex., center); Madison and Nebo, Ark. (Little Rock, Ark., center); Dalton, Ga. (Atlanta, Ga., center).

The observer at Chattanooga, Tenn., takes cotton-region observations, and telegraphs them, daily, to Atlanta, Ga.

The name of the station at Witho, Tenn., was changed by the Post-Office Department to Arlington.

Each district sends by mail, daily, to observer, New Orleans, La., a copy of Form 138b, containing the maximum and minimum temperatures and the rainfall at each special station in the district.

To obviate any difficulty that might arise on account of the telegraph lines being down or in trouble, and thus delay the transmission of reports to the centers, each cotton-region observer mails, daily, to his section center a copy of the cipher report (Form 203); and as soon as the missing report is received at the section center, the information it contains is entered on a Form 138b (cotton-region bulletin), and mailed to New Orleans.

I would urgently recommend that the following be submitted in the next year's estimates for the appropriations for this service, under the item headed "Observations and

expenses incidental thereto, announcing the probable approach and severity of frosts, for the benefit of the cotton region of the United States: Cotton-region observations and reports:" Two hundred and fifty stations at 50 cents per day, from April 1 to October 31, $26,750; instruments and instrument shelters, $2,000; incidentals, $1,250. And under the item headed "Telegraphing reports, messages, and other information in connection with the observation and report of storms, &c.:" For collecting cotton-region reports, $10,700.

These reports have, heretofore, been telegraphed by the railroad companies free of charge, but owing to many delays, failures, and other irregularities resulting from the free system, it is now desired to secure for their transmission that promptness and regularity which can only be obtained by regular rates.

The following copy of a letter from Mr. James F. Nanry, secretary committee of information and statistics, New York Cotton Exchange, New York City, is added to this report for the reason that it furnishes valuable information in regard to the cotton crop, and gives the opinion of business men upon the usefulness of the reports made at the stations in the cotton region:

"NEW YORK COTTON EXCHANGE,
"*New York, May* 17, 1886.

"DEAR SIR: Pressure of private and other business has hindered our committee from looking out the towns which we recommend to be used as points from which to get daily reports of the weather, especially as affecting the cotton crop.

"The most important thing for the crop is the rainfall, and it should be reported every twenty-four hours with accuracy, not in averages from centers, but the actual amount at each place.

"If to this is added the maximum and minimum thermometer readings for the twenty-four hours, there is nothing more to be desired, and any planter, factor, or dealer who will study these three records can get a good idea of the crop prospects.

"In choosing the towns, we have tried to keep as closely as possible to your published list of stations dated March 1, 1884, General Orders No. 21. Some places where little or no cotton is grown we have dropped, others we have added when much cotton is raised. We have also kept to the railroad lines as much as possible, though that plan rather ties down the distribution of places.

"We hope you will be able to put this plan into operation, as by it alone can we get accurate and reliable weather reports to judge of the cotton crop.

(Here follows a list of stations.)

"Very respectfully, yours,

"JAMES F. NANRY,
"*Secretary Committee of Information and Statistics.*

"Brig. and Bvt. Maj. Gen. W. B. HAZEN,
"*Chief Signal Officer, U. S. Army, Washington, D. C.*"

I am, very respectfully, your obedient servant,

F. B. DAY,
Second Lieutenant, Signal Corps, U. S. Army.

The CHIEF SIGNAL OFFICER OF THE ARMY,
Washington, D. C.

APPENDIX 8.

REPORT ON THE DISPLAY OF SIGNALS FOR THE PROTECTION OF MARINE INTERESTS.

SIGNAL OFFICE, WAR DEPARTMENT,
Washington City, June 30, 1886.

SIR: I have the honor to make the following report upon the system of cautionary wind signals used by the Signal Service for the protection of marine interests, in operation during the year ending this day:

The display of signals has continued during the past year as heretofore.

On December 1, 1885, signals, with the exceptions noted below, were discontinued at all stations on Lake Superior, and at all other lake ports on December 15, 1885, navigation having closed for the season.

The display of cautionary signals continued throughout the entire year at the following places: Grand Haven and Ludington, Mich.; Milwaukee, Wis.; Saint Joseph, South Haven, and Manistee, Mich. The display was resumed on Lake Superior May 1, 1886, and at all other points of display on the lakes April 15, 1886, on the resumption of navigation.

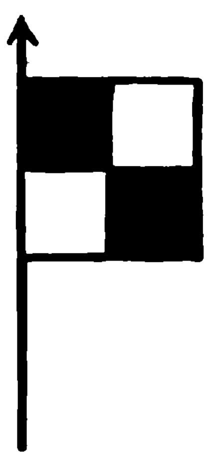
The new signals recently adopted by this service for announcing the approach of wind storms are of three kinds, viz.:

(1) The cautionary signal.
(2) The direction signal.
(3) The on-shore signal.

The cautionary day signal is a square red flag, with black square center; the night signal is a red light. When hoisted it indicates that a wind velocity of 35 miles per hour, or over, is expected to blow within 100 miles of the places at which the signals are displayed. This velocity of wind is considered dangerous to all classes of shipping.

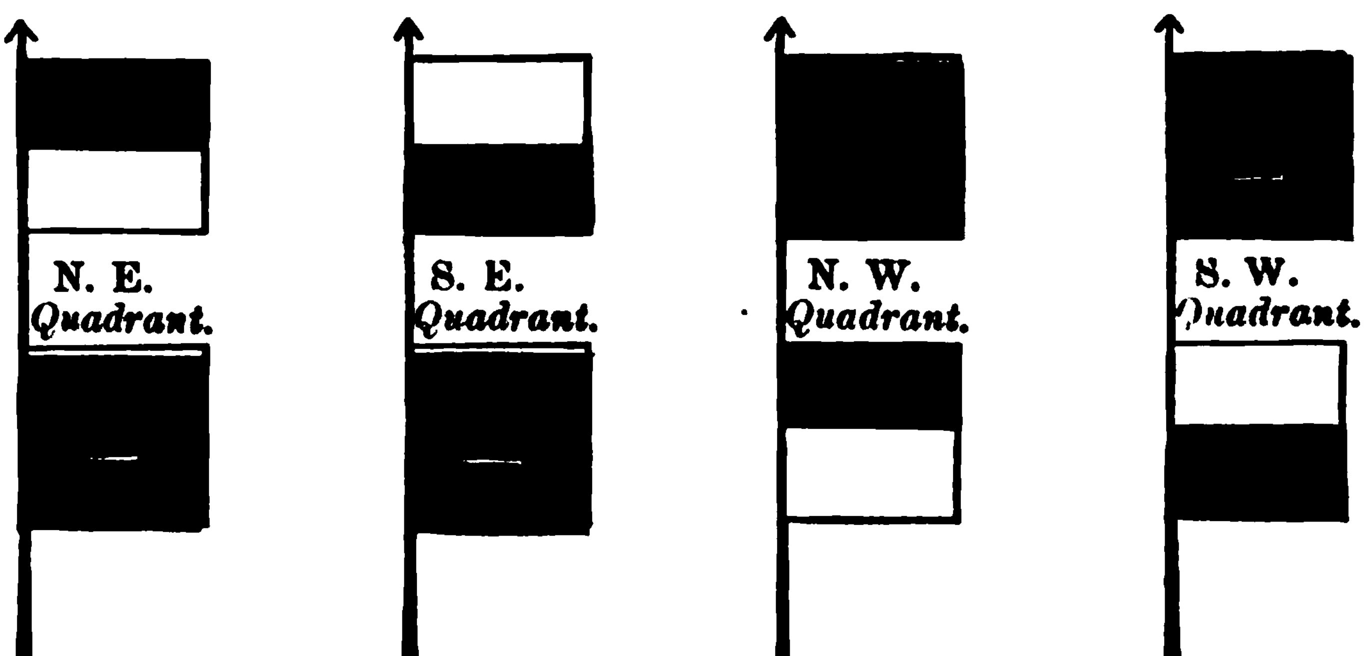
The direction signal is a square flag, composed of two horizontal stripes, one black and the other white. It is only displayed with the cautionary signal flag, and indicates from what quadrant the dangerous wind is expected to come. For the purpose of designating these quadrants the compass has been divided into the NE., SE., SW., and NW. quadrants. In the order to hoist a direction signal it is stated from which quadrant the dangerous wind is first expected. There is no night display for the direction signal.

The on-shore day signal is a square flag composed of four smaller squares, two white and two black, so arranged that squares of like colors touch each other at the inner corners. It is only displayed at lake ports where regular full-reporting meteorological stations of the service are in operation.



The on-shore signal indicates that the wind will blow in an on-shore direction with a velocity of from 20 to 35 miles per hour at the place where the signal is displayed. This velocity of wind is considered dangerous to small vessels, barges, and tows on the lakes. The on-shore night signal is a white light.

A direction signal is not hoisted in connection with the on-shore signal. It is only displayed with the cautionary signal, and not more than 3 feet above or below it, in the following manner:



It will be seen from the above cut that the direction flag is above the cautionary flag for easterly winds and below for westerly, while the black stripe in the direction flag is above the white stripe for northerly winds and below for southerly.

When the cautionary signal is hoisted alone, it indicates that the direction from which the dangerous wind may come has not been determined.

This new system of cautionary signals went into operation May 1, 1886. It is not necessary to advert to the old system of cautionary signals, as they have been fully explained in previous reports.

The velocity of wind heretofore accepted as justifying a cautionary signal has been 25 miles per hour at all stations, as shown by the reading of the anemometer at the place where the display was made. The velocity to justify a signal has been changed, and cautionary signals are not now ordered unless a wind velocity of 35 miles or more per hour is expected, as has already been explained.

The observer at each cautionary station using an anemometer has been informed the number of miles per hour, as shown by his anemometer, that will be equal to the above-mentioned verifying velocity.

The special display station at Traverse City, Mich., was discontinued March 16, 1886.

The following special display stations have been established during the year: Barnegat City, N. J.; Cedar Tree Neck, Mass.; Chicago Water Crib, Ill.; Point Judith, R. I.; Sankaty Head Light, Mass.

The display of wind signals has been suspended at Southeast Light, R. I., pending repairs to the cable, which is broken.

The special display stations were inspected by the observers in charge of section centers during the last half of the year. This inspection was imperatively necessary on account of the adoption of the new system of wind and direction signals, and from the experience of former years I am of opinion that these stations should be visited by the observers from the section centers at least once each year to see that the work is performed in a satisfactory manner and that shipping interests are fully served. Each inspector was charged to properly instruct the displaymen in the manner of hoisting and lowering the signals, and in their general duties; to inspect the Government property, and recommend such action as seemed necessary to make the station and display of the greatest benefit to the public.

The following display stations were thus inspected:

Sergt. Allen Buell, Chicago, Ill., visited Saint Joseph, South Haven, Muskegon, Montague, Pentwater, Ludington, Manistee, Frankfort, Northport, Elk Rapids, Charlevoix, Petoskey, and Cheboygan, Mich.

Sergt. S. W. Rhode, Milwaukee, Wis., visited Racine, Kenosha, Sheboygan, Manitowoc, Kewaunee, Ahnapee, Sturgeon Bay, and Green Bay, Wis., and Menominee, Mich.

Sergt. N. B. Conger, Detroit, Mich., visited Sand Beach, Bay City, and East Tawas, Mich.

Sergt. Peter Wood, Erie, Pa., visited Ashtabula, Ohio, and Dunkirk, N. Y.

Sergt. J. G. Linsley, Oswego, N.Y., visited North Fair Haven and Cape Vincent, N.Y.

Private B. A. Kinney, Portland, Me., visited Bath, Rockland, Southwest Harbor, and Boothbay, Me.

Sergt. O. B. Cole, Boston, Mass., visited Marblehead, Gloucester, and Newport, Mass.; Portsmouth, N. H.; New Bedford, Wood's Holl, Hyannis, Highland Light, Bass River Light, and Provincetown, Mass.

Sergt. John G. Lynch, New London, Conn., visited Stonington, Conn.; Bristol, R. I., Fall River, Mass., and Newport, R. I.

Sergt. J. O. Conway, Narragansett Pier, R. I., visited Point Judith, R. I.

Sergt. Meyer Herman, New Orleans, La., visited Port Eads, La.

Sergt. J. P. Sherry, Norfolk, Va., visited Fort Monroe, Va.

Sergt. S. C. Emery, Savannah, Ga., visited Port Royal, S. C.; Tybee Island, and Brunswick, Ga.

Sergt. J. W. Smith, Jacksonville, Fla., visited Fernandina, Fort George Island, and Saint Augustine, Fla.

Sergt. E. W. McGann, Rochester, N. Y., visited Charlotte, N. Y.

Sergt. W. W. Eichelberger, New York City, visited City Island, N. Y.

Sergt. I. A. Reed, Indianola, Tex., visited Corpus Christi, Tex.

Sergt. Appleton Pritchard, Mobile, Ala., visited Fort Morgan, Ala.

Sergt. J. H. Sherman, New Haven, Conn., visited New Haven Light, Conn.

Private H. B. Boyer, Key West, Fla., visited Sand Key Light, Fla.

Full and complete instructions for the guidance of displaymen have been prepared in pamphlet form, and copies will shortly be furnished each special display station.

I would earnestly recommend that the following be included in the next estimate of appropriations for this service, under the item headed: "Expenses of storm, cautionary, and other signals on the sea, lake, and gulf coast of the United States, announcing the

probable approach and force of storms, including the pay of observers, services of operators, lanterns, flags, &c.:"

Pay of displaymen	$7,500 00
Lanterns and flags	5,000 00
Incidentals (such as repairs to flag-staffs, &c.)	2,500 00
	15,000 00

The flag-staff at the special display stations of the Service are located as below:

Ahnapee, Wis.—The flag-staff is on a slight eminence inside the harbor piers and about 40 feet high; the signal can be seen from the lake and harbor.

Bass River Light, Mass.—The flag-staff is near the light-house.

Bath, Me.—The flag-staff is on the roof of the United States custom-house, which commands a view of the whole city and harbor.

Barnegat City, N. J.—The flag-staff is located in front of the Oceanic Hotel, and commands a fine view of the ocean.

Bay City, Mich.—The flag-staff is at the foot of Seventh street, and can be seen for 3 miles in any direction; it is about 75 feet high.

Boothbay, Me.—The flag-staff is situated on a hill at the head of the bay, commanding a good sight of the harbor and its entrance.

Brunswick, Ga.—The flag-staff is on the top of a high building, and commands a fine view.

Cheboygan, Mich.—The flag-staff is on top of the village hall, and can be seen from the harbor.

City Island, N. Y.—The flag-staff is on the roof of the office of the Ship News' Association, which is also the office of the displayman.

Corpus Christi, Tex.—The flag-staff is on the top of a high hill. The flags and lights can be seen for about 3 or 4 miles.

Dunkirk, N. Y.—The flag-staff is on the top of a five-story building, commanding ing a good view of the harbor.

East Tawas, Mich.—The flag-staff is on the beach near the steamboat landing, and is 100 feet high. It can be seen distinctly all over Tawas Bay.

Frankfort, Mich.—The flag-staff is on Main street, in the western part of the village. A new pole will probably be erected in front of the post-office on Main street, where the signals can be seen from every part of the harbor.

Gloucester, Mass.—The flag-staff is on the top of the custom-house, and the signals are visible from all parts of the harbor.

Green Bay, Wis.—The flag-staff is on the top of a grain elevator, and can be seen from the bay and river.

Highland Light, Mass.—The flag-staff is close to the station house, and near the light-house. All vessels going in and out of the bay pass within view of the signal.

Hyannis, Mass.—The flag-staff is on a high bank near the light-house.

Kenosha, Wis.—The flag-staff is on the top of the Simmons Building, and can be seen from every portion of the harbor and bay.

Kewaunee, Wis.—The flag-staff is on a high hill overlooking the town and harbor. The location is excellent, and the signals can be seen by vessels passing far out on the lake.

Ludington, Mich.—The flag-staff is at the corner of Ludington avenue and Harrison street. The pole is 150 feet high, and the location is excellent.

Manistee, Mich.—The flag-staff is on the roof of the Englemann block, corner of South Water and Maple streets. The location is very good, and the flag can be seen from every part of the harbor.

Manitowoc, Wis.—The flag-staff is on top of the telegraph-office building, one block from the river, and can be seen from every part of the river and harbor.

Marblehead, Mass.—The flag-staff is in front of the town hall, which is only one block from the beach. The signals are plainly visible from the river and harbor and for a distance of from 10 to 12 miles out on the bay.

Fort Morgan, Ala.—The flag-staff is on the parapet of Fort Morgan.

Montague, Mich.—The flag-staff is on the roof of a warehouse, between Montague and Whitehall. It can be seen from every part of the harbor.

Muskegon, Mich.—The flag-staff is on the roof of the Mason block, corner of Western avenue and First street, in the central part of the city. The display can be seen from every part of the harbor.

New Bedford, Mass.—The flag-staff is on the wharf of the Philadelphia and Reading Coal Company, and is visible from all parts of the harbor.

New Haven Light, Conn.—The flag-staff is on the top of the abandoned light-house at this station.

Pentwater, Mich.—The flag-staff is in a central part of the town. It can be seen from every part of the village.

Petoskey, Mich.—The flag-staff is on Lake street, between the depot and the Cushman House. It can be seen from every part of the harbor.

Provincetown, Mass.—The flag-staff is on the top of a high hill in the center of the town.

Racine, Wis.—The flag-staff is on the roof of the warehouse of the Goodrich Transportation Company at harbor entrance. Vessels passing in or out of port pass within 50 feet of the flag-staff.

Rockland, Me.—The flag-staff is on the roof of the United States custom-house.

Saint Joseph, Mich.—The new flag-staff to be erected will be placed on a high bluff overlooking the harbor, at the foot of Ship street, and can be seen from every part of the harbor.

Sand Beach, Mich.—The flag-staff is immediately in front of the displayman's office, and can be seen from the lake and bay.

Sheboygan, Wis.—A new flag-staff will shortly be erected at this station.

South Haven, Mich.—The flag-staff is on a high bluff in the western part of the town, and can be seen from every part of the harbor.

Southwest Harbor, Me.—The flag-staff is on a hill overlooking the harbor, and in an excellent position.

Sturgeon Bay, Wis.—The flag-staff is on the dome of the Court House, and has an elevation of about 150 feet above ground. The signals can be seen from Lake Michigan, and from the canal and Sturgeon Bay to the entrance from Green Bay.

Tybee Island, Ga.—The flag-staff is on the top of the old tower, the highest point on the island, and is 40 feet above the ground.

Wood's Holl, Mass.—The flag-staff is at Nobska Point near the light-house. The displayman at Wood's Holl displays the signals from a staff in front of his house, and they are duplicated at Nobska Point. The signals can be seen by all vessels passing through Vineyard Sound.

Very respectfully, your obedient servant,

F. R. DAY,
Second Lieutenant, Signal Corps.

The CHIEF SIGNAL OFFICER OF THE ARMY.
Washington, D. C.

APPENDIX 9.

RIVER REPORTS AND FLOOD-WARNINGS.

SIGNAL OFFICE, WAR DEPARTMENT,
Washington City, June 30, 1886.

SIR: I have the honor to submit my report on the system of river and flood reports for the year ending this day, together with such additional data as have been gathered since last report.

The value of simultaneous river reports from and between river stations, at selected points in the various water-sheds of the country, does not consist wholly in the fore-warning of dangerous rises, however valuable these warnings may be. It is important that in addition, continuous and exact observations should be made and permanent records kept for the benefit of the commerce of our navigable rivers and shipping interests generally. It is very important to know the stage of water at all times, but more especially is this valuable when the water is at a very low stage, as, from the information furnished by the records at the Signal Service river stations, captains and others can determine the height of water at places where there are dangerous bars.

Since the establishment of the Pittsburg, Chattanooga, and Saint Louis River systems, with the observer at the central station in charge of the special reporting stations in the section, the plan has met with such gratifying results that it has been widely extended, and centers have been established at Cairo, Leavenworth, Little Rock, La Crosse, Nashville, New Orleans, Shreveport, and Vicksburg, for the collection of river reports from the special stations, for distribution to places and interests affected by high and low water.

It being advisable to have the gauges at a number of the river stations rebuilt or replaced, the bench-marks and zeros properly determined, the reports distributed over as large an area as possible, and the service made of as much benefit to the public as the money allotted for the purpose would permit, Mr. H. W. Brewer, civil engineer and river expert, has during the past two years inspected the following river stations, and, when possible, determined the height above sea-level of the zero of the gauges and the danger lines, together with such other information as would tend to give these river reports to the public in the shortest time, and at places where they would be of the most benefit. The following places have been thus visited by Mr. Brewer:

Decatur, Ala., Johnsonville, Tenn., Paducah, Ky., Warsaw, Ill., Evansville, Ind., Louisville, Ky., Cincinnati, Ohio, Marietta, Ohio, Wheeling, W. Va., Camden, Ark., Bayou Sara, La., Vicksburg, Miss., Yazoo City, Miss., Arkansas City, Ark., Little Rock, Ark., Newport, Ark., Fulton, Ark., Shreveport, La., Monroe, La., Girard, La., Delhi, La., Coushatta Chute, La., Alexandria, La., New Orleans, La., Nashville, Tenn., Carthage, Tenn., Burnside, Ky., Saint Louis, Mo., Saltsburg, Pa., Mahoning, Pa., Brookville, Pa., Weston, Pa., Parker's Landing, Pa., Clarion, Pa., Warren, Pa., Freeport, Pa., Johnstown, Pa., Oil City, Pa., Lock No. 4, Pa., Morgantown, W. Va., and Rowlesburg, W. Va.

As an example of this work, the observer at Cairo, Ill., sends at 3 p. m, daily, two special messages, one to the river observer at Evansville, Ind., containing the river words from Pittsburg, Cincinnati, Louisville, Mount Carmel, Nashville, Chattanooga, Paducah, and Saint Louis; and the other to Messrs. Fowler, Crumbaugh & Co., at Paducah, Ky., containing the river readings at Cairo, Chattanooga, Cincinnati, Evansville, Louisville, Mount Carmel, Nashville, Pittsburg, and Saint Louis.

These telegrams, which are sent in cipher, are, upon being received, translated and entered on manifold bulletins and posted in prominent places near the steamboat landings.

At the urgent request of the citizens of Shawneetown, Ill., and vicinity, for reports of the stage of water in the Wabash and Ohio Rivers during floods and dangerous rises, a special river station was established on the Wabash River at Vincennes, Ind., March 1 1886. A contract has been made for the erection of a river-gauge at Vincennes, and regular observations will be taken during floods and telegraphed to Shawneetown, Ill., where arrangements have been made for bulletining them for the information of the public.

The observer at Cairo, Ill., has been instructed to send special reports by telegraph to Shawneetown when the water at Cincinnati marks 38 feet, and is rising. These special reports will contain the river heights at Cincinnati, Louisville, Evansville, and Mount Carmel; and they will be suspended when the Ohio River begins to fall at Evansville, as it is then considered that the danger at Shawneetown is passed.

The appropriation for river and flood reports not being sufficient to continue both the 7 a. m. and 2 p. m. river observations at the stations in the Pittsburg, Pa., section, it was necessary, on March 1, 1886, to discontinue the 2 p. m. river observation at all places in that section that had, prior to that date, taken two observations daily.

The time of taking the gauge readings at Burnside, Ky., was changed by Instructions No. 66, 1885, so that observations will be taken hereafter from December 1 to August 1, each year; and at Carthage, Tenn., from December 1 to July 1.

The following stations have not been inspected by Mr. Brewer: Albany, Oreg.; Colusa, Cal.; Charleston, Tenn.; Clinton, Tenn.; Dardanelle, Ark.; Eugene City, Oreg.; Folsom City, Cal.; Grand Tower, Ill.; Harper's Ferry, W. Va.; Kingston, Tenn.; Leadvale, Tenn.; Lexington, Mo.; Loudon, Tenn.; Marysville, Cal.; Mount Carmel, Ill.; Mount Holly, N. C.; Oroville, Cal.; Peoria, Ill.; Rockwood, Tenn.; Strawberry Plains, Tenn.; Saint Joseph, Mo.; Umatilla, Oreg., and Vincennes, Ind.

At the present date there are sixty-eight paid special river stations in operation.

The river observer at Muscatine, Iowa, makes no charge for rendering monthly reports to this office.

The following river stations were established during the year: Lock No. 4, Pa. (Pittsburg, Pa., center), December 11, 1885; Dardanelle, Ark. (Little Rock, Ark., center), January 11, 1886; Lexington, Mo., (Saint Louis, Mo., center), February 18, 1886; Vincennes, Ind. (Cairo, Ill., center), March 1, 1886.

The following river stations were discontinued during the year: Prescott, Wis. (La Crosse, Wis., center), July 24, 1885; Brownsville, Pa. (Pittsburg, Pa., center), December 1, 1885; Brunswick, Mo. (Saint Louis, Mo., center), December 15, 1885; Rockwood, Tenn. (Chattanooga, Tenn., center), December 31, 1885.

The following extracts from letters written by observers at river stations, and from special river observers, give interesting data concerning the floods that occurred during the year, and the benefits that have been derived from river reports:

Mr. J. B. Miles, special river observer at Helena, Ark., in a letter dated May 3, 1886, says:

"You will notice in my report that the river rose rapidly on April 25 and 26, 1886, and suddenly fell off. This rapid rise continued until during the night of April 26, when those who were watching the levees and gauge said it not only stopped rising, but fell suddenly when the levees gave way. At the time the levees gave way the river was rising half an inch an hour and remained stationary for a few hours, and then commenced rising nearly one-fourth of an inch per hour, until at sundown of the 27th when the levees gave way at Austin, and then the river fell about one inch, but afterwards regained the fall and continued to rise until it attained the highest point ever reached here—48.1 feet."

The observer at Keokuk, Iowa, in a letter dated June 3, 1886, says:

"The river reports are of importance to steamboatmen, raftsmen, and lumbermen, at all seasons of the year, and the masters and pilots of all boats stopping consult the bulletin for reliable information.

"Steamboatmen then know how deep they may load their boats, and what channels may be safely run.

"Raftsmen can ascertain if it is safe to run the rapids, saving the time of coming through the Des Moines Rapids Canal.

"On May 4, 1886, Mr. B. B. Hinman, a capitalist owning a large tract of bottom lands south of the Des Moines River, called at the office for information. The observer gave as his opinion, based on the reports received, that there was danger of an additional rise of two feet. Mr. Hinman at once put a force of men to strengthening his levees; and neighboring farmers took the same precaution, saving their lands from overflow. Had these lands been overflowed the planting of the crops would have been greatly retarded."

The observer at New Orleans, La., in a letter dated June 8, 1886, says:

"The system of special river stations and reports in this section is of great benefit to rivermen and shippers, as is shown by the following: The greater portion of the Ouachita River was too low for navigation, so that Capt. L. V. Cooley was compelled to store freight for several trips, to points that could not be reached on the banks of the river below these points until he had navigable water. He asked me once if he could make a trip next day and receive freight for all his points. I advised him to do so, as heavy rains were falling in that section, as shown by the reports. He acted on the advice. In the mean time the river rose about 10 feet. He was therefore able to deliver the freight he had aboard, and that which he had stored."

"This is one of many instances where these reports have been of such great value and benefit to the rivermen and shippers. The amount saved by these reports in this section alone will more than pay for the entire river service."

The observer at Cairo, Ill., in a letter dated June 10, 1886, says:

"The special telegram from your office, dated March 30, 1886, announcing the overflow of the low lands in this vicinity, was of incalculable benefit to both farmers and railroad companies, as well as all classes of business situated along the river front. Farmers immediately took steps to move their stock to a place of safety, and to dispose of their grain. Railroad companies began to rip-rap their road-beds, and all classes of business on the river front made preparations for the rise predicted. The value of the river reports to merchants, railroad companies, factories, mills, and farmers in this vicinity cannot be estimated. Every available means was utilized in warning the people of the coming flood. All railroad companies and business men were furnished with a copy of the a. m. and p. m. river bulletin. The railroad companies had the full report telegraphed to their presidents, stationed in other cities, daily, and every railroad station along the river was furnished with the full report in the same way."

The observer at Augusta, Ga., in a letter dated June 12, 1886, commenting on the necessity of river stations, says:

"Were it possible to establish a special river station at a point below the junction of the Broad and Savannah Rivers, a distance by water of 100 miles from here, and daily reports furnished this station, the knowledge of sudden rises in the river would prove of great value to the farmers along the river country, by means of which they would be enabled to shelter stock in places of safety and secure them beyond reach of these devastating and destructive floods."

The observer at Louisville, Ky., in a letter dated June 9, 1886, says:

"That the system of river reports is beneficial to those who have interests at stake on the river and adjacent to it, is shown by the interest, these people take in them. During the recent flood they were especially valuable, and were watched by rivermen and others whose interests were threatened by a sudden rise.

"The Signal Service reports are the only ones regarded as authentic, and frequent requests for information are made to this office by prominent business men of the city, both by telephone and by personal application. The press manifests its interests in the reports by publishing them daily for the benefit of their readers."

The observer at Pittsburg, Pa., in a letter dated June 9, 1886, remarking on the value of river reports, says:

"There is no other work of the service in this city of which the benefits are so immediately recognized, or more highly appreciated, and the only complaint of those interested in the navigation of the rivers is the few stations in the section, and the few reports from those in operation."

The observer at Nashville, Tenn., in a very comprehensive report, dated June 7, 1886, on the river system in his section and of the floods which occurred between March 31 and April 14, 1886, says:

"Prompt and timely warning was given to the lumber, steamboat, and other interests in this city, and at Clarksville, Tenn., forty miles below Nashville.

"Tri-daily bulletins were issued from 2 p. m., March 31, to 11 p. m., April 14, 1886. Following the issue of a few special river-bulletins, the entire population seemed to place implicit confidence in the system of river reports, and great was the demand therefor. Thousands of requests were made as to the probable stage the river would reach. The losses to the business interests were comparatively light, owing to the timely warnings sent out. Families who resided on low ground sustained heavy losses. Though warned in time, many were unable to remove their household effects to higher ground, simply for the reason that they were too poor to do so.

"The damage to farming lands in the upper counties amounted to considerable. The damage would have increased twofold had not timely warning been given. In many cases the wheat crop became a total loss. Much fencing was also destroyed.

"The following practical illustration may tend to show the great usefulness to which the Cumberland River Service has attained in this community:

"The total expense incurred during the floods, at the special river stations, from March 31, to April 15, 1886, was

"Burnside, Ky.:	
"Services as special observer	$7 00
"Expense of telegraphing	3 00
"Carthage, Tenn.:	
"Services as special observer	10 00
"Cost of telephone messages	7 80
"Total cost	$27 80

"From the above it will be noted that the cost of the special service was only $27.80. This is an insignificant sum in comparison with the money value of property saved here, and at Clarksville, 40 miles below. As the 'Daily Morning American' wisely puts it, 'this is the most economical and useful department of the Government.'

"The following table shows the amount of damage, expressed in money value, which occurred in and around Nashville during the floods of March 31, to April 15, 1886, estimated with great care and accuracy:

Name.	Business.	Actual loss.	Estimated loss if warnings had not been given.
Prewitt, Spurr & Co	Lumber, hardwoods, buckets, &c	$550 00	$10,000
Edfield & Nashville Manufacturing Company.	Doors, veneering, and fancy woodwork.	200 00	700
William Sutherland & Co	Lumber and planing mill	0	4,000
Nashville Cooperage Company	Barrels and buckets	350 00	900
B. S. Rhea & Son, grain elevator	Corn, oats, and wheat	0	500
Indiana Lumber Company	Straight lumber	350 00	800
Leibmann, Loveman & O'Brien	Doors, sash, and blinds	0	400
Steamboat interests		0	1,100
Nashville Lumber Company	Lumber and hardwood	0	600
City Water Works		200 00	3,000
Nashville Blood Horse Association	Stables, &c	300 00	2,000
Cooper & Co	Lime, plaster, and cement	250 00	5,000
B. G. Wood	Boilers and smithing	25 00	200
Brick-yards		5,000 00	9,000
Miscellaneous, household goods, street-car obstructions, &c.		35,000 00	90,000
Total		42,225 00	128,200

"The two years experience with the river system has already fully demonstrated that it is practicable for the prediction of rises to within one or two feet at this point. The only difficulty which has to be overcome is the uncertainty of time it takes for the wave to reach Nashville from the headwaters. This rate of progress varies with certain stages of the water. For instance, if the water is at a low stage at Carthage and Nashville the wave travels slower from Burnside downward; should the water be moderately high, say 15 to 20 feet at Nashville and Carthage, the rate of flow is faster."

The Mobile Cotton Exchange and Chamber of Commerce, in a letter dated November 30, 1885, strongly requested that river stations be established in Upper Alabama and Northern Mississippi. The following extract is made from this letter:

"The stage of water in the upper rivers of Alabama and Northeast Mississippi is a question of much importance to the trade relations of Mobile and the interior.

"Several times during the last two months the absence of such information has prevented boats from receiving freight from the upper rivers when their navigation was entirely practicable. There are large quantities of cotton on these rivers now awaiting shipment, and delays and difficulties occur annually for want of this information.

"We therefore respectfully request and urge the Signal Service Bureau, in behalf of the merchants of Mobile and the planters and merchants of the interior, that river-gauges be established."

On account of the insufficient appropriation this office was compelled to inform these gentlemen that it was impossible to establish these stations at present.

Saint Louis, Mo.—The observer at Saint Louis, Mo., in a letter dated June 17, 1886, says:

"Considerable benefit is derived from the system of special river reports in this section.

"Telegraphic reports from Hermann and Kansas City, Mo., Warsaw and Peoria, Ill., were received daily, as they are of value to rivermen in this city at all seasons of the year.

"The New Orleans Anchor Line and the Mississippi Valley Transportation Company receive daily reports by telephone of the stage of the water at the above-named points immediately upon their receipt at this office, and these companies often load their steamboats and barges according to the river reports.

"The station at Jerome, Mo., has been of considerable benefit to citizens of that vicinity, who are largely interested in tie-rafting. By means of the rain-gauges they can determine, with some degree of accuracy, the probable height the river will attain, and are thereby enabled to take proper measures for the safety of their rafts."

The following extract of a letter from Mr. W. P. Hammond, a prominent farmer at Warsaw, Ill., furnishes interesting facts in regard to the value of river reports in the vicinity of Warsaw:

"The advantages of the river station at this place to the 80,000 acres of alluvial lands between Warsaw and Quincy is almost inestimable, giving as it does to the owners or occupants timely warning of the approach of dangerous floods from above. The 300,000 acres above the mouth of the Illinois is very much affected by any unusual water at this point, lying as it does just below the Des Moines, which often contributes dangerous additions to the Mississippi floods."

Chattanooga, Tenn.—The observer at Chattanooga, Tenn., in a communication dated June 17, 1886, remarking upon the usefulness of the special river reports in his section, says:

"Every one was kept fully posted twice a day of the exact stage of the water and amount of rainfall during the recent floods. The most important points above and below, as far as Paducah, were notified by telegraph of the alarming condition of things. The trained river observers at Strawberry Plains, Knoxville, and Loudon on the Tennessee, at Clinton and Kingston on the Clinch, at Leadvale on the French Broad, and at Charleston on the Hiawassee Rivers, forwarded their reports promptly and accurately. These reports were the only reliable information received and were the means of saving at least $500,000 worth of property.

"Without the system of flood reports established by this service the public would be obliged to rely upon such information as the newspapers furnish, and this would be wholly unreliable, owing to the proneness of special correspondents to exaggerate and send in startling items rather than plain facts."

RIVER STATIONS.

Saint Paul, Minn.—The zero of the river-gauge is 1.75 feet below the low water of September 5 and 13, 1877.

Elevation above sea, 673 feet.

Danger begins at 7 feet.

La Crosse, Wis.—The zero of the gauge is the low water of 1871, and is about 643 feet above sea-level.

The United States engineers give elevation of low water of 1884 as 621.23 feet above sea-level.

Danger begins at 24 feet.

The United States engineers give the highest water as 15.47 feet, occurring in June, 1870.

Wabasha, Minn.—The river-guage is placed on one of the front piles of the elevator wharf near the foot of Alleghany street. It was erected by the United States engineers. The zero is 656 feet above sea-level.

Danger begins at 6 feet, when the low-lands on the Wisconsin side are submerged and some houses at the north end of the town have water on the lower floors.

The highest water known was in 1880, when it reached a height of 13 feet above low-water mark.

Dubuque, Iowa.—The zero of the river-gauge is the low water of 1864, and is 584 feet above sea-level.

Danger begins at 16 feet.

The United States Engineer's report for 1880–'82 gives the elevation of low water of 1864 as 578.22 feet above sea-level.

Le Claire, Iowa.—The zero of gauge is the low water of 1864, about 545 feet above sea-level.

Danger begins at 10 feet.

Highest water occurred in June, 1880—14.50 feet.

United States Engineers' report 1880–'82 gives the low water of 1864 as 554 feet above sea-level.

Davenport, Iowa.—The zero of gauge is 0.34 feet below low water of 1864, and is 545 feet above sea-level.

Danger begins at 15 feet.

Highest water, 20.50 feet, occurred in 1868. The zero of the river-gauge on Rock Island bridge is 541.15 feet above sea.

Keokuk, Iowa.—The river-gauge now in use is one owned by the United States Engineers, and is placed in the canal.

The zero of the gauge is 476.71 feet above sea-level.

Danger begins at 14 feet.

Highest water occurred in 1851—21.50 feet. United States precise bench-mark No. 1 is a copper bolt in coping of shore side of lower lock of the Des Moines Rapids Canal, Keokuk. It is 492.35 feet above sea-level, and 15.64 feet above zero of gauge.

Warsaw, Ill.—The river-gauge is located on the north side of the Keokuk packet depot.

The bench-mark is a cross cut in the top surface of stone sill of a blind window near the north end of the west face of I. W. Barne's brick warehouse, and marked thus: "B. M." X This bench-mark is 25.87 feet above zero.

Elevation of bench-mark and zero of gauge above sea not yet determined.

Length of gauge above zero 23.30 feet. The zero point is the low water of 1864, and is 3 feet above the bed of the river. Its elevation above sea-level is 474 feet. Depth of water below zero about 3 feet. Danger line on gauge, 12 feet, and when the water reaches this point the low-lands on both sides of the river begin to overflow. The area subject to overflow at this stage is 40,000 acres on the Illinois side, and something over that on the Missouri side. This stage endangers farming interests. At 18 feet other property, such as houses, stock, &c., are endangered, especially stock. Floods from the Des Moines and Fox Rivers are generally very sudden.

The greatest danger is from ice when the river breaks up.

Louisiana, Mo.—The river-gauge is cut on the draw-pier of the bridge, and is the property of the Chicago and Alton Railroad.

The zero of gauge is 436.23 feet above sea-level. Danger begins at 12 feet. Highest water was in 1851, when it reached 21.94 feet on gauge. United States precise bench mark 24 is a copper bolt set vertically in top surface of stone forming the northeast corner of the west abutment of the railroad bridge at Louisiana. It is 466.61 feet above sea-level, and 30.38 feet above zero of gauge.

Beardstown, Ill.—The river-gauge is placed on the draw-pier of the Chicago, Burlington and Quincy Railroad bridge over the Illinois River.

The height of gauge above zero is 24.80 feet.

Top of tie on bridge above zero, 34.63 feet.

Zero above sea-level, 423 feet.

United States bench-mark is the top of uppermost stone of northwest corner of foundation of a reddish-brown brick house at the foot of Jefferson street. Elevation above low-water surface, 20.55 feet. Established November 7, 1876, from water-surface bench-mark at Frederick.

Highest water occurred in 1882, when it reached 22 feet above zero.

Danger begins at 12 feet, at which height low farming lands are submerged.

Yankton, Dak.—The zero of the river-gauge is the bed of the river, and is 1,176 feet above sea-level.

Danger begins at 24 feet.

Omaha, Nebr.—The zero of river-gauge is low water of 1867.

Elevation above sea-level, 983 feet.

Danger begins at 18 feet.

Plattsmouth, Nebr.—The zero of the river-gauge is the low water of December 6, 1873.

Elevation above sea-level, 908.75 feet.

Danger begins at 16.58 feet.

Leavenworth, Kans.—The zero of the river-gauge is the low water of November, 1871.

Elevation of zero above sea-level, 753 feet.

Danger begins at 20 feet.

Highest water was on April 29, 1881, and was 25.83 feet.

Kansas City, Mo.—The zero of gauge is 1.50 feet below low water of December 2, 1874.

Elevation above sea-level, 734 feet.

Danger begins at 21 feet.

Highest water was in 1884, 37 feet.

Boonville, Mo.—The zero of the river-gauge is the low water of December 1, 1872.

Elevation above sea-level, 547 feet.

Danger begins at 20 feet.

Hermann, Mo.—Zero of gauge, low water of 1878, about 477 feet above sea-level.

Danger begins at 21 feet.

Highest water occurred in May, 1881, 24.58 feet.

Jerome, Mo.—The river-gauge is on the west face of the west trestle of the Saint Louis and San Francisco Railroad bridge over the Gasconada River at this place.

The rail on bridge is 683 feet above sea-level.

The zero of gauge is 27.50 feet below this rail, and 655.50 feet above sea-level.

Saint Louis, Mo.—The river-gauge is the property of the United States Engineers. It is placed at the foot of Market street.

Zero of gauge is 379 feet above sea-level.

Danger begins at 30 feet.

The bench-mark is the city directrix, which is 412.75 feet above sea-level, and 33.75 above the zero of gauge.

U. S. precise bench-mark is a small hole in copper bolt leaded horizontally in the west pier of arch No. 4, on east side of pier of Saint Louis steel bridge. It is 20.14 feet south of north end of pier, and 1.12 feet above top course of granite. The letters "U. S." are cut in the granite below the bench-mark.

Elevation 436.68 feet above sea and 57.68 feet above zero of gauge.

The lowest water recorded at Saint Louis occurred on December 21, 1863, and there is every indication in the record, before and after, that it was occasioned by an ice-gorge. The zero of the river-gauge was placed at this low water of 1863, and has so continued to the present date.

In October, 1871, a regular gauge was established by the Signal Service, and was read for the first time on the 16th of that month; and in 1873 the first permanent gauge was established.

Before 1871 the record was kept by a Mr. Jacob Leopold. There was no gauge, and the level of the water surface was ascertained by leveling down from the city directrix.

In 1873 the river was for three days 0.14 foot below the zero of the gauge, the river at that time being closed by ice.

In 1872 the river was below zero for twenty days, when not actually closed by ice, seven of these days, December 5th to 11th, being preceded and followed by a frozen river.

In 1871 it was below zero twenty-seven days—October 16th to November 11th.

Warren, Pa.—The river-gauge is located on the west face of the north abutment of the suspension bridge over the Allegheny River.

The height of gauge above zero is 16 feet, and it is 12 inches wide.

Zero below the top line of abutment, 22.83 feet.

Average depth of water over riffle, .83 of a foot.

Danger-line begins at about 7 feet on the new gauge.

The elevation of the zero of gauge above sea-level has not been determined.

Oil City, Pa.—The river-gauge is placed on the southeast bank of the river. The zero point is 6 inches above the low water of September, 1880, and is level with the bed of the river on Charles's riffle, the shallowest point between Oil City and Pittsburg.

Elevation of Union Depot above sea-level, 1,008 feet.

Elevation of zero above sea-level, about 985 feet.

Highest water occurred on March 17, 1865.

Danger begins at 13 feet, when the water flows into the cellars in the business part of the town.

At 20 feet it flows over some of the streets and endangers two of the bridges which span the river.

Clarion, Pa.—The river-gauge is located on the north abutment of the Clarion County bridge over the Clarion River. The gauge is placed partly on the abutment and partly on a natural rock (the foundation of the abutment), and has a stone 4 feet 6 inches in length planted at the foot of the natural rock, sunk flush with the water-line as it then stood, the top surface of the planted stone being the zero of the gauge. The zero of gauge is 25.58 feet below the top line of the abutment.

Height of gauge above zero, 20 feet.

Average depth of water below zero on Toby Mill riffle, 1 foot.

The exact elevation has not been determined, but it is about 1,052 feet above sea-level.

The danger-line has not been exactly ascertained, but is about 10 feet above the zero of the present gauge.

The observer, Mr. T. W. Raine, reports that the height of water on the gauge will not correspond with height as generally given by rivermen; for example, when there is what is called a 6-inch stage (a stage at which empty crafts can be safely floated) the marks on the gauge show about 28 inches. In extreme low water there are many rocks in the channel that stick up 18 or 20 inches, while all around them there may be a foot or more of water. When the water is 6 inches over the tops of these rocks there is said to be a 6-inch stage. A 2-foot stage is a good rafting stage, and corresponds to 4 feet 2 inches on the gauge.

Mahoning, Pa.—The river-gauge is located on the pier of the Allegheny Valley Railroad bridge across the mouth of Mahoning Creek.

Height of gauge, full length of pier, 29.83 feet above zero.

Width of gauge, 12 inches.

Zero of gauge below the rail on bridge, 33.08 feet.

Elevation of rail above sea-level, 827.55.

Elevation of zero above sea-level, about 794.47 feet.

Average depth of water below zero, 3 feet.

Mahoning Creek drains an area of nearly 400 square miles. Its valley is very narrow and bounded by steep side-hills. The fall is 8 feet per mile.

Any rise from Red Bank Creek, which empties into the Allegheny about 10 miles above, and drains about 650 square miles of area, would first be reported from this gauge.

Brookville, Pa.—The river-gauge is located on first pier of the Allegheny Valley Railroad bridge over the Red Bank Creek, which point is below the intersection of Red Bank with Sandy Creek.

The gauge extends upward 16 feet above the zero.

Depth of water below zero is 1 foot.

Height of rail on bridge above zero, 40 feet.

Two elevations are given for Brookville by the State Geological Report, namely, 1,234 and 1,211 feet. The lowest one has been adopted as the probable height. Dr. Gannett gives the elevation of the railroad depot as 1,235 feet above sea.

Height of rail above top of pier is 13 feet, and if the elevation of 1,211 feet is accepted, the elevation of zero above sea-level is 1,173 feet.

Parker's Landing, Pa.—The river-gauge is located on the first pier of bridge over the Allegheny River.

Height of gauge above zero is 30 feet; width of gauge, 12 inches.

Elevation of zero above sea-level, not yet determined.

The zero of gauge is referred to the rail in front of the depot.

Top of planking of bridge roadway below rail, 2.55 feet.

Zero of gauge below planking, 36 feet.

Top of pier below planking, 4 feet.

Zero of gauge below rail, 38.55 feet.

Average depth of water below zero, 1.50 feet.

Zero point is the top line of foundation of pier.

Saltsburg, Pa.—The river-gauge is located on the middle pier of the county bridge over the Kiskiminitas River, below the junction of Connemaugh and Loyalliana Rivers.

The zero is referred to two tracks of the railroads, the old Pennsylvania Railroad where it crosses Point street, and is 891 feet above sea-level, and the new or West Pennsylvania Railroad where it crosses Washington street, and is 854 feet above sea-level.

Level of footway on bridge over pier is 855.01 feet above sea-level.

The zero of gauge is the top line of the foundation of pier, and is 26.75 feet below the footway of the bridge, making zero 828.26 feet above sea-level.

The gauge is the full length of the pier, 26 feet.

Average depth of river below zero, 3 feet.

Danger to property, from Saltsburg to the junction of the Kiskiminitas with the Allegheny, is imminent when the water reaches 6 feet on the gauge.

Highest water ever known was in 1859, when it nearly reached the bridge, flooding streets that run parallel with the river.

Johnstown, Pa.—The river-gauge is placed on the first pier of the Johnstown bridge of the Pennsylvania Railroad.

Bench-mark is the top rail over the gauge, which is referred to a frog at crossing of railroad, the elevation of which above sea-level is 1,184 feet, as furnished by the engineer of the Cambria Iron Works. The bench-mark (this rail) is 5 feet below this frog, or 1,179 feet above sea-level.

The zero of gauge is 31.16 feet below the bench-mark and is the top line of the foundation of bridge pier, and its elevation above sea-level is 1,147.84 feet.

Length of gauge above zero, 15 feet.

Width of gauge, 10 inches.

Zero above bed of river, 2.50 feet.

Danger line begins at 7 feet on the gauge.

Rowlesburg, W. Va.—The river-gauge is located on the center pier of the Baltimore and Ohio Railroad bridge over Cheat River.

Height of gauge above zero, 17 feet.

Height of zero above sea-level, 1,375.34 feet.

Bench-mark of the United States Coast and Geodetic Survey, situated on center pillar west end of the Baltimore and Ohio bridge over Cheat River, is 1,402 feet above sea-level.

Zero of gauge, 26.66 feet below bench-mark.

Morgantown, W. Va.—The river-gauge is located on the north face of the south abutment of bridge over Decker's Creek, 28 feet being on the abutment and 6 feet on a stone planted in the bed of the creek.

The zero point is the same as the old gauge—790 feet above sea-level.

Danger begins at 20 feet.

The Government is building a dam 9 miles below, on the Monongahela River, which it is believed will raise the water 2 feet 9 inches on the new gauge. This rise has not, however, been fully determined.

When the stage of water is zero the bed of the river under the suspension bridge is nearly dry.

Morgantown is the head of the present slackwater improvement now in course of construction by the Government.

Weston, Pa.—The river-gauge is located on the north side of east abutment of the county bridge over the west fork of the Monongahela River, and is partly made of curb, slanting down from the foot of the abutment to the edge of low water.

Height from zero to bridge seat on abutment, 25.41 feet.

The height of zero of gauge above sea-level has not yet been fully determined, but is about 824 feet.

Danger begins at 18 feet on gauge.

Average depth of water in river, 6 inches.

Lock No. 4, Pennsylvania.—The river-gauge is located on the inside face, lower end of river wall of lock, the marks being cut in the stone. This gauge is to be extended when the lock is finished by placing a plank gauge on the upper log-wall of lock. The bench-mark is the top surface of the new wall just over the gauge. Its elevation above sea-level is 745.77 feet. The elevation of zero of gauge above sea-level is 719.87 feet. Height of gauge when finished, 40 feet. The zero is intended to be the bottom of the river.

Danger line is 28 feet. The low-water reports are the most important to rivermen. There is not much danger from high water, as only the creek bottoms are overflowed; the banks on both sides of the river, a short distance from the margin, rise abruptly and to a considerable height. The greatest danger arises from floating ice, which sometimes gorges when the river is not more than from 18 to 20 feet high, and often causes great damage to steamboats and coal-barges.

Pittsburg, Pa.—The zero of the river-gauge is the wharf log at the foot of Market and is 694 feet above sea-level.

Danger begins at 22 feet.

The observer at Pittsburg reports that the Davis Island Dam, 5 miles below that city, was put in operation October 7, 1885. When the wickets of the dam are raised to their full height the stage of water, as indicated by the station gauge, will be about 6.2 feet. All stages of water below 6.2 feet will be influenced by the operations of the dam.

Freeport, Pa.—The river-guage is placed on the West Pennsylvania Railroad bridge across Buffalo Creek, and is 18 inches above Dock Riffle, one mile above gauge. Height of gauge is 25 feet; the lower end covered about 2 feet by rocks and deposits, so that from 2 feet downward a temporary gauge is located. Above 25 feet the height of water is read by means of a gauge convenient for reference, placed either on the bridge or other prominent point. The zero of gauge is the low water of 1868; elevation above sea-level of railroad track on bridge, 772 feet. Zero of gauge, 31 feet below railroad track, and 741 feet above sea-level. Danger begins at 20 feet, but it would not become general until a height of 25 or 30 feet had been reached. Thirty-five feet would flood all the flats along the river. Buffalo Creek drains an area of about 150 square miles.

Wheeling, W. Va.—The river-gauge is located on the levee, 330 feet north of Twelfth street. It is made of sandstone, set flush with the surface of the levee, and is marked in feet and quarters of feet. The high-water mark of February, 1884, is the bench-mark, and is cut in the stone bottom of "O. G.," on top of water-table on southwest corner of custom-house, corner Sixteenth and Market streets, and is marked "H. W., February 7, 1884." Its elevation is 664.66 feet above sea-level.

Elevation of zero of gauge above sea-level, 611.57 feet. Height of gauge above zero, 35 feet. Depth of water below zero, 13 inches. Danger line, 36 feet on gauge.

At 30 feet on gauge the lowlands, both above and below this point, begin to overflow. At 36 feet the water is backed up in some of the cellars on Main street.

The highest water was in 1884, when it reached 54 feet above the zero of gauge.

Marietta, Ohio.—The river-gauge is located on the levee at the foot of Second street.

From 5 feet above zero to 34.50 feet it is made of sandstone. Extensive repairs have been made to the upper portion of this gauge.

The bench-mark is the top of the stone foundation of the southwest corner of a brick house (J. N. Peaker's), which stands on the corner Ohio and Second streets.

The elevation of this bench-mark is 623.05 feet above sea-level.

Elevation of zero above sea-level is 582 feet.

The height of gauge at present above zero is 34.50 feet.

Depth of water below zero is 1.50 feet.

Danger-line on gauge is 25 feet, and when the water reaches this point the low farming lands, both above and below Marietta, begin to overflow, Second and Third streets are under water, and some of the cellars on Front street are filled. A flood of 34 feet in August, 1876, entirely destroyed the crops in the lowlands.

Cincinnati, Ohio.—A new river-gauge is in course of construction, and the zero has not been determined.

Louisville, Ky.—The river-gauge is located on the levee at the foot of Fourth street. The lower portion, from zero to 26 feet, is made of granite flagging 4½ feet wide, and in length from 4 to 8 feet, embedded in the surface of the levee, with the top surface of the flag flush with the surface of the levee. Down the center of the flagging an iron strap 5 inches wide is fitted and marked in feet and inches, from zero to 26 feet. From the 26-foot mark the gauge is continued by painted lines and figures on the iron pillar of the Shore Line Railroad trestle up to 47 feet 8 inches.

There are two bench-marks, one located by Mr. J. A. Weise, engineer of the Jeffersonville, Madison and Indianapolis Railroad, who ran a line of levels from a Coast Survey bench-mark on the Ohio and Mississippi Railroad bridge near North Vernon, Ind., and connected with the northeast corner of the Indiana abutment of the Louisville Railroad bridge. This bench-mark is 481 feet above sea-level; zero of gauge below this bench-mark is 76.68 feet. Another bench-mark has been established on the top surface of the foundation-stone on which the railroad trestle rests, and is 26.20 feet above zero of gauge, and 430.52 feet above sea-level. The zero of the gauge is the bottom of the river in the chute over the falls, and its elevation above sea is 404.32 feet.

The height of gauge above zero is 47 feet 8 inches.

Danger line is 24 feet.

At 24 feet the lowest portions of the city begin to overflow, and Portland, a suburb of Louisville, is very generally under water, and also a large area of lands on both sides of the river, between Louisville and Evansville, is covered with water.

This gauge was constructed for the purpose of knowing the amount of water on the falls.

There is another gauge in the canal at the foot of Tenth street, the zero of which is 2.16 feet below the first mentioned one, and gives the amount of water in the canal. There is also another gauge at the lower end of the canal where it enters the river, below the falls. The zero of this gauge is 29.07 feet below the zero of the Fourth street gauge.

The observer reports the amount of water in the canal, and this is the information the steamboat men desire, as they are aware of the difference in the gauges, and knowing this they can tell whether they can go through the chute or will have to take the canal, and what the water is over the falls.

Evansville, Ind.—The river-gauge is located on the levee at the foot of Main street. At the upper end is a post 12 by 12 inches and 5 feet above ground. From the foot of this post a timber, 4 by 8 inches, with an iron strap, 4 inches by one-half inch, fastened to the top face and marked in feet and tenths, extends to low-water mark.

The bench-mark is the top face of the iron door-sill, on Main street, next to Water, of a brick house on the corner of Main and Water streets.

Elevation of bench-mark, 368.84 feet above sea-level, and 48.84 feet above zero of the gauge.

Length of gauge above zero, 50 feet.

Depth of water below zero is as follows: At zero there will be 2.50 feet of water on the sand-bar near Henderson's Island, 15 miles below; at Scuffletown Bar, 18 miles above Evansville, there will be 1.50 feet of water.

Danger line, 30 feet. When the water reaches this point the low lands on both sides of the river begin to overflow. At 40 feet, all the low farming lands are submerged, and the town of Hurricane, Ky., is also flooded. When the river reaches 40 feet above zero, nearly the whole of Union township is under water, and from Evansville to Newburg, 12 miles above, tenement houses are in great danger.

Knoxville, Tenn.—The river-gauge is located on the second pier of the county bridge, and is fastened by clamping-pins.

Extreme high water was in 1867 and 1875, and was 39 feet above zero of the gauge.

Extreme low water was in 1871 and 1884, and is the zero of the gauge.

The water has never been so high as to make a danger line.

Chattanooga, Tenn.—The zero of the river-gauge is the low water of September, 1839. The zero of the gauge is 49.9 feet above the Union Depot, and 621 feet above sea-level.

Danger-line is at 33 feet, and at 38 feet many dwellings are flooded.

Burnside, Ky.—The zero of river-gauge is at low-water mark, and its elevation above sea-level is 589 feet.

Danger begins at 30 feet.

Carthage, Tenn.—The river-gauge is placed on the bank of the river as it inclines.

The water rises at Carthage as high as 60 feet.

Danger begins at about 30 feet.

The elevation of zero of gauge is about 443 feet above sea level.

Nashville, Tenn.—The river-gauge belongs to the United States Engineers.

The zero of gauge is the low water of September, 1863, and is 6 inches higher than the river-gauge used previous to May 1, 1884.

The zero of gauge is about 366 feet above sea level.

Danger begins at 40 feet.

Decatur, Ala.—The river-gauge is located on the down-stream end of the south pier of the L. N. S. and N. A. R. R. bridge, to which it is secured by 7 iron bolts wedged in holes drilled in the rocks of the pier. It is made of 4 by 3 inch lumber, painted white, and graduated from zero to 32 feet, inclusive.

The top of the top course of stone on pier is the bench-mark, and is 571.17 feet above sea level.

Elevation of zero above sea, 537.51 feet. Length of gauge above zero, 32 feet. Depth of water below zero, 5 feet.

Danger begins at 21 feet. When the water marks zero on this gauge it will give 16 inches on Bridgeport Bar. When the gauge marks 21 feet danger begins to property on the north side of the river, which is much lower than on the south side. Any rise over this not only endangers crops, but also the stock, and in some very low places the houses are in danger.

Johnsonville, Tenn.—The river-gauge is placed on the north corner of the elevator building, and is made of 5 by 2 cypress lumber, painted white, and graduated from zero to 50 feet.

The bench-mark is a cross, cut in the top surface of the coping of west abutment of railroad bridge, and marked thus: B. M. +

Elevation of bench-mark above sea-level, 362.83 feet. Elevation of zero of gauge above sea-level, 318.83 feet. Zero below bench-mark, 44 feet. Length of gauge above zero, 50 feet. Depth of water below zero on Duck River Bar, 15 miles above this point, 3.50 feet. Average depth of channel at Johnsonville, 4 feet.

Danger line, 21 feet, when the low lands on both sides of the river begin to overflow crops are endangered, and also stock, on the west side.

The river is navigable all the year as far up as Waterloo, 100 miles above this point.

Paducah, Ky.—The river-gauge at Paducah, was erected and is owned by the United States Engineers. It is 6 by 6 inch timber, planted in the ground along the surface of the levee, as the same inclines, from Main street to low-water mark. A strap of iron, 5 inches wide by one-half inch thick, is spiked to the top surface of gauge, and marked in feet and tenths of feet from zero to 48 feet, inclusive; from 48 to 59 feet the gauge is of board 4 by 2 inches, nailed to the southeast side of Fowler, Bro. & Co.'s grocery store. The graduations on this board are marked with copper tacks.

Elevation of zero and the elevation of bench-mark have not yet been determined. The height of gauge above zero is 59 feet. Zero of gauge will give 40 inches of water on Grand Chain, 25 miles below Paducah, and an average depth of 3.50 feet on the bar in front of the town.

When the water reaches the danger line, 40 feet, the low lands opposite Paducah, and on both sides of the river down as far as Cairo, begin to overflow. This overflow only endangers farming interests. Property at Metropolis, Joppa, and Ogden's Landing is in danger when the gauge at Paducah marks 44 feet.

Cairo, Ill.—The river-gauge is placed on the levee at the foot of Fourth street.

Zero of gauge is 269.60 feet above sea-level.

United States bench-mark is a copper bolt let into the northwest face of the custom-house wall, 23.50 feet from the north corner and 3 feet above the ground, and marked thus: "U.S." B.-M.

Elevation, 3 16.69 feet above sea-level.

Bench-mark above zero, 47.09 feet.

Danger begins at 40 feet, which will overflow the adjacent lowlands in Missouri and portions of Kentucky, but will not affect the town of Cairo.

At 51.33 feet water would overflow the levee.

Highest water, 52.17 feet, occurred in 1883.

Newport, Ark.—The river-gauge is located on the second in-shore pile, west side of the elevator building at Newport, The bench-mark is on the engine-house of the elevator building, cut in the foundation-wall facing the river, and on the west corner; it is marked thus: "B. M."

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The elevation of the bench-mark above sea-level is 228 feet. The rail at depot of Saint Louis, Iron Mountain and Southern Railroad is 232 feet above sea-level.

The zero of the gauge is placed at low-water mark of 1878, when there was only 30 inches of water on the Lower Little Island bar, 45 miles above the mouth of the river. Elevation of zero of gauge above sea-level, 198.128 feet, 29.872 feet below bench-mark, and 33.872 feet below rail.

The length of the river-gauge is 37 feet, extending from 35 feet above zero to 2 feet below it. The danger line is reached when the gauge reads 21.50 feet, at which height

low-lands five miles below and ten miles above Newport begin to overflow, and from this point on to the mouth of the river, provided the Little Red or Mississippi Rivers are full. The Mississippi, when bank full, will back the water in the White River as far up as Duvall's Bluff, 173 miles from its mouth, and overflow the adjacent low-lands. Should the White River be high at the same time all the low-lands would be dangerously flooded. The water has never been so low that navigation for regular boats has been stopped between the mouth of the river and Jacksonport, on the White River, and as far as Pocahontas, on the Black River, 145 miles above Jacksonport. At medium high water navigation extends to Forsyth, Mo., 300 miles above Jacksonport, on the White River. At very low water boats will rub at nearly every bar.

Memphis, Tenn.—There are two river-gauges at this place—one on the levee, 120 feet south of Jefferson street; the other on the northwest corner of the elevator building. The zeros of the gauges are on the same plane, 182.73 feet above sea-level. Both gauges belong to and are kept in repair by the United States Engineers.

Bench-mark is the door-sill of No. 254 Irvin Block, corner of Second street and Alley.

Elevation of bench-mark above zero, 77.067 feet.

United States bench-mark No. 4, on house No. 280 Front street, is 89.012 feet above the zero of gauge.

Average time for high water to reach Memphis from Cairo is 4.30 days; from Memphis to Helena, 2.30 days.

Danger begins at 34 feet.

Highest water occurred in 1883, and was 35.58 feet.

Helena Ark.—The river-gauge belongs to the United States engineers. It is placed on the right-hand side, on the leg of the elevator.

The bench-mark is a copper bolt in the east front of the Tinney Building, between York and Elm streets. It is 50.098 feet above the zero of gauge. This bench-mark is 190.838 feet above sea-level, and zero of gauge is 140.74 feet above sea-level.

There is a second bench-mark near the railroad depot, consisting of a square stone marked "U. S.," which is 40.65 feet above zero of gauge, and 181.39 feet above sea-level.

Danger begins at 37 feet.

The highest water occurred April 30, 1886, and was 48.1 feet.

Fort Smith, Ark.—A new river-gauge was built during 1885, and the zero of this gauge was placed at the low water of 1856, which is 7 feet lower than the zero of the old gauge.

The gauge is built of stone curbing.

Readings on this gauge commenced April 1, 1885.

Little Rock, Ark.—The river-gauge is made of 6 by 6 inch timber; it is in good condition, and is 31 feet in length. The gauge is painted white, and the graduations, which are in feet and inches, are marked with black paint both on the face and side. The gauge is fastened to a solid rock, called Little Rock, by three iron bolts, and the foot imbedded in the rock to which it is bolted. Gauge is not perpendicular, but is inclined.

Bench-mark is the curbstone southwest corner of Main and Markham streets, and is 286.814 feet above sea-level.

The zero of gauge is 61.514 below bench-mark.

Elevation above sea, 225.30 feet.

The zero of gauge is also referred to an iron bolt imbedded in the top face of the rock to which the gauge is fastened. This bolt is 8 feet and 4 inches from the gauge in a southwest direction, and the top of the bolt is 25.17 feet above the zero of the gauge.

Danger begins on both sides of the river at 23 feet on the gauge, when plantations 12 miles below and on to the mouth of the river begin to overflow.

At 26 feet danger is very extensive both above and below.

The bottom of the river at Little Rock consists for the most part of shifting sand, and is very changeable. At low water the channel is very crooked, and changes with every rise of the river.

Arkansas City, Ark.—The river-gauge is fastened to a pile at the southeast corner of the elevator building, and belongs to the Mississippi River Commission. The gauge is made of 8 by 2 inch board, painted white.

Bench-mark is the top surface of a nail driven in the root of a large tree standing in the middle of the street, and is about 250 feet from the Parker House. This bench-mark reads on gauge 44.194 feet. Elevation of zero of gauge above sea-level, 94.97 feet. Danger begins on both sides of the river at 42 feet, when the water is at the foot of the levees.

Highest water occurred February 27, 1882, when the gauge marked 47.10 feet.

Camden, Ark.—The river-gauge is attached to the down-stream side of a large tree, nearly opposite a Mr. Ritchie's store, and the zero point is 3 feet lower than on the old gauge, which was on the up-stream side of the same tree.

The bench-mark is a granite sill of the easternmost door of Mr. Ritchie's store. Another bench-mark referred to a mark on the root of a pin oak, about three-quarters of a mile from the gauge, said to have been placed there by Col. James Martin, engineer Texas and Saint Louis Railroad.

Elevation of door-sill bench-mark above sea-level, 132 feet. Elevation of zero of gauge above sea-level, 69.80 feet. Length of gauge above zero, 50 feet. Depth of water below zero, 3 feet. Danger line on gauge is 39 feet.

Highest water was in May, 1882, and would mark 46 feet on new gauge. High water at this place is caused principally by the waters from the Little Missouri River, which empties into the Ouachita River about 48 miles above Camden. The rises are sudden, often as much as 12 or 15 feet in a night.

At 8 feet on the new gauge navigation would be possible. At high water the river is navigable to Arkadelphia, 100 miles above; but Camden is considered as the head of navigation.

The bottom of the river changes very little, being composed of gravel and hard sand.

Girard, La.—The river-gauge is placed on the trestle of the Vicksburg, Shreveport and Pacific Railroad bridge over Bayou Bœuf. The zero of gauge is the low-water line of 1884; it is 33.25 feet below the top of rail on bridge, and 1½ feet above the water in channel. Length of gauge above zero, 30 feet.

Danger line on gauge, 20 feet. When this point is reached the entire country in the vicinity begins to overflow. The greatest danger is from high water in the Mississippi River, which comes in through the broken levees at Possum Fork and Bennett Clair crevasse.

The elevation of zero above sea-level has not been determined.

Monroe, La.—The river-gauge is painted on the east pier of the Vicksburg, Shreveport and Pacific Railroad bridge; is 1½ feet wide and 47 feet 9 inches high. It was constructed by and belongs to the railroad company; was repainted last year, and can be easily read from the bank.

Danger line for the low-lands below is 40 feet.

The river is navigable at all times for small boats. Navigation of regular packets ceases when the gauge marks 6 feet. Rises are sudden, sometimes 7 feet in twenty-four hours.

The highest water on record, 49.10 feet, occurred in 1874.

The elevation of zero of gauge above sea-level has not been determined.

Vicksburg, Miss.—The river-gauge is located on the elevator building, and is the property of the United States Engineers. There is also one at Kleinston, about 1½ mile below. The harbor of Vicksburg has filled up so much since the gauge was erected as to cover the lower end of the gauge to a height of 17 feet. When the river gets below this stage the gauge at Kleinston is used.

The bench-mark for the Vicksburg gauge is a row of tacks driven into a section of the gauge, which is fastened on the northwest corner of the Prentiss House.

Elevation of bench-mark above sea, 95.938 feet.

Elevation of zero of gauge, 51.138 feet.

Elevation of zero above sea-level, 44.80 feet.

The zero of gauge at Kleinston is on the same plane with that of Vicksburg. The bench-mark for the Kleinston gauge is the head of a spike driven into the top of riverward post of a disused bumping-block, distant 100 feet below Sweeney's saloon at Kleinston.

Elevation of nail above sea-level, 92.911 feet.

Elevation of nail above the zero of gauge, 48.111 feet.

A correction should be applied to the readings of this gauge of —.40 of a foot, it being that much in error.

Highest water in 1864, which was 52.83 feet.

At 41 feet danger begins to lands on the Louisiana side of the river.

Yazoo City, Miss.—The river-gauge is attached to the right-hand end pile, down stream of the draw-protection of the Yazoo City bridge.

The bench-mark is the bottom of a stone built into the wall of the warehouse of the Parish steamboat line, and marks the high water of 1882.

The elevation of bench-mark and the zero of gauge above sea-level has not yet been determined. The gauge is 41 feet above zero and 2 feet below.

The zero of gauge is 40.80 feet below high water of 1882, and is the low-water line of 1875, when Short Creek Bar, about four miles below Yazoo City, has 2½ feet of water over it.

Danger begins on both sides of the river when the gauge marks 29.50 feet.

The water is never so low as to prevent boats from going up as far as Greenwood, 160 miles above Yazoo City. The mouth of Cold Water River, 327 miles above Yazoo City, is considered as the head of navigation.

Fulton, Ark.—The river-gauge is located on the north pier of the Saint Louis, Iron Mountain and Southern Railroad bridge over the Red River. The bench-mark is the top of pier on which the gauge is placed, and is 267.772 feet above sea-level.

Zero of gauge is 229.95 feet above sea-level.

Length of gauge is 35 feet above zero and 3 feet below.

Danger begins at 25 feet, when the lowest lands on both sides of the river begin to overflow. At 32 feet the lowlands in the immediate vicinity of Fulton are overflowed.

The highest recorded water was 32.75 feet in August, 1876.

Shreveport, La.—The river-gauge is made of plank, 2 by 4 inches and 37 feet long, and is placed in a groove on pier 4 of the Vicksburg, Shreveport and Pacific Railroad bridge. The graduations and numbers are marked with brass-head tacks, and are in feet and inches.

The zero of the gauge is the low-water line of 1879.

There is a difference in the elevation above sea-level, as determined by Captain Woodruff, United States engineer. He gives the elevation as follows:

High water of 1849 is 180 feet above sea-level.

High water of 1884 read 35.913 feet on the gauge.

Height of zero of gauge above sea, 144.087 feet.

Mr. Fallett, an engineer on the Vicksburg, Shreveport and Pacific Railroad, gives the bench-mark on corner of Commerce and Cotton Streets as 203.26 feet above sea-level, and the low water of 1879 as 43.11 feet below this. This gentleman gives the zero of gauge above sea-level as 160.15 feet.

The lowest water occurred on September 1 and 2, 1881, and was 1 foot and 5 inches below zero of present gauge.

Danger begins at 29 feet.

Coushatta Chute, Louisiana.—The river-gauge is placed on the bank in front of a Mr. Wilson's house, part being perpendicular and part inclined.

The zero-point is the low water of 1881.

The gauge is graduated to 41 feet above zero.

The elevation above sea-level has not been determined.

Danger begins at 26 feet, at which stage the lowlands about four miles below this place begin to be flooded.

The highest water of which any record can be found was in 1883, and would read 31.86 feet on the gauge. Water was said to have been higher in 1866, but no marks can be found.

The gauge was damaged on January 4, 1886, by a steamboat running into it, to such an extent that it is unserviceable.

Alexandria, La.—The river-gauge is a new one, erected by the United States Engineers last year. It is made of 6 by 8 inch timber, well secured to, and has the same inclination as, the bank. The numbers and graduation lines are marked with copper tacks.

The zero of the gauge is the low water of 1881. Height of gauge, 38 feet.

The highest water on record occurred in 1866, and marks 36.46 feet on the gauge.

The lowest water was 3.70 feet below the zero of the gauge.

Danger begins at 33 feet.

The levees, both above and below Alexandria, are broken, and until they are repaired the land is liable to overflow, and danger would begin at 31 feet. When the levees are in good order danger is not apprehended until the gauge marks 33 feet.

The line of high water of 1866 is marked on a large oak tree standing in the northeast corner of the court-house lot. The mark is made with three nails and two cuts, thus:

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o o o
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and is 36.46 feet above the zero of gauge.

The elevation of the zero of gauge above sea-level has not been determined.

Delhi, La.—The river-gauge is placed on the north perpendicular post of first trestle west of the turn-table of the Vicksburg, Shreveport and Pacific Railroad bridge over Bayou Mason. The zero is the low-water line of 1881. Zero below the top rail on bridge, 40.75 feet.

The zero of gauge above sea-level has not been determined.

Danger begins at 20 feet.

Highest water was in 1882, and would mark 37.50 feet on gauge. When danger line is reached all the land in the section known as overflow lands begins to overflow. The high water here, as at Girard, is caused by the overflow from the Mississippi River. No danger from the Bayou Mason; all danger arises from the water that comes in from broken levees. Bayou Mason is navigable for small boats 20 miles above. When the river is at a 4-foot stage navigation ceases.

West Melville, La.—The river gauge belongs to the U. S. Engineers.

The zero point is 37 feet below the high water of 1882, and 4 feet below the zero point of gauge at Barber's, near the head of the river. Four feet is the slope of the river between the two points.

Zero below base of rail on the bridge is 44.90 feet.

The high water of 1882 was the highest ever known here.

The gauge is in three sections on the bridge and two on the shore. It is graduated and numbered up to 50 feet.

The lowest recorded stage of water was in 1884, and marked 3.80 feet on the gauge. The water of 1881 was considerably lower, but there is no record of the poin tit marked on the gauge.

Danger begins at 31 feet, and when the water reaches this stage it overtops the banks on both sides of the river and begins to overflow plantations both above and below this place.

In 1884, at a 6-foot stage of water, the boats ceased to run, owing to the low water on the bar in the old river. During 1885 another bar formed at the mouth of Red River, which obstructs navigation to a great extent both in Red and Atchafalaya rivers. Dredging on the bar is expected to be completed at an early date. The stage of water at which navigation would be interrupted depends in a great measure upon this work.

Bayou Sara, La.—The river gauge is partly on a pile at the down-stream end of the West Feliciana Railroad wharf and partly on an inclined timber extending into river and anchored at the bottom.

The bench-mark is a line on the south side of the southwest brick pillar supporting a house occupied by Mr. W. Hand, and is situated near the West Feliciana Railroad depot. The line is marked by three nails driven into the pillar. Elevation above zero, 40 feet.

U. S., B. M., XXXIX is the top of copper bolt in limestone monument at the north-east end of base line, directly opposite Bayou Sara.

Elevation above sea-level, 37.90 feet.

Zero of gauge below bench-mark, 34.71 feet.

Zero of gauge above sea-level, 3.19 feet.

Danger begins at 28 feet when the water reaches the foot of the levees.

New Orleans, La.—The river gauge is placed on a pile, with four piles braced together, forming a protection around it. The gauge is situated in the rear of the ferry wharf at the foot of Canal street.

The bench-mark is a stone marked "X," the city datum point, and is the high water of 1874. It is 16.12 feet above the zero of gauge and 14.62 feet above sea level.

The zero of gauge is the low-water line of December 30, 1876, and is 1.50 feet below sea level.

Highest water in 1874, which was 16.17 feet.

Danger begins at 13 feet.

Readings on this gauge commenced November 1, 1885, when the zero of gauge was changed from high water of 1874 to the low water of 1876, the new zero. 'Readings are 16.2 feet lower than those made prior to November 1, 1885.

I would most strongly urge that the following be inserted in the estimates of appropriations required for this service for the fiscal year ending June 30, 1888:

River and flood observations, and expenses incidental thereto, $13,000. This item is for observers, $6,679.50; services of river expert, $1,800; river gauges, $3,000, and incidentals, $1,440.50.

Very respectfully, your obedient servant,

F. R. DAY,
Second Lieutenant, Signal Corps.

The CHIEF SIGNAL OFFICER OF THE ARMY.

APPENDIX 10.

RAILWAY WEATHER BULLETIN SERVICE.

This system continues in active operation, and its increasing popularity is made manifest through reports from railroad stations at which the indications are posted for the benefit of the public.

This mode of disseminating the weather predictions is most highly appreciated by the agricultural interests in sections traversed by co-operating railroads, farmers consulting the bulletin at their local railway station, to be guided by its warnings, before beginning the work of the day.

The indications are telegraphed over their lines by co-operating railroad companies each morning, and posted at 1,349 stations throughout the country. A few telegraph and telephone lines have, within the past year, inaugurated this system of distribution of the indications; and reports from their officials show that the success of the undertaking is much beyond their expectations.

A list of railroads and telegraph and telephone lines co-operating in this work is given below.

List of railroads co-operating with the United States Signal Service and the number of stations on each line at which weather indications were posted for the benefit of the public during the year ending June 30, 1886.

Railroads.	Number of stations.	Railroads.	Number of stations.
Allegheny Valley	30	Louisville and Nashville	20
Atchison, Topeka and Santa Fé	98	New York and New Eng and	62
Baltimore and Ohio	89	New York Central and Hudson River	8
Baltimore and Potomac	4	Northeastern	7
Bellaire, Zanesville and Cincinnati	9	Northern Central	22
Boston and Lowell	13	Ohio River	9
Boston and Maine	65	Old Colony	115
Charleston and Savannah	7	Pennsylvania	87
Chicago and Alton	12	Philadelphia and Erie	21
Chicago and West Michigan	39	Philadelphia and Reading	118
Cincinnati, Washington and Baltimore (Marietta and Cincinnati Division)	15	Philadelphia, Wilmington and Baltimore	20
		Pittsburg, Fort Wayne and Chicago	54
Cleveland, Columbus, Cincinnati and Indianapolis	44	Portland and Ogdensburg	10
		Providence and Worcester	14
Cleveland, Loraine and Wheeling	7	Richmond and Allegheny	26
Cumberland Valley	9	Saint Louis and Cairo	14
Detroit, Grand Haven and Milwaukee	4	Saint Louis, Iron Mountain and Southern	20
Detroit, Lansing and Northern	20	South Carolina	13
East Tennessee, Virginia and Georgia (Memphis and Charleston Division)	7	Southern Central	6
		United Railroads of New Jersey	42
Flint and Pere Marquette	14	Washington, Ohio and Western	7
Grand Rapids and Indiana	64	West Jersey	35
Grand Trunk	13	Worcester, Nashau and Rochester	18
Huntington and Broad Top Mountain	8		
Lehigh Valley	30	Total	1,349

List of telegraph and telephone companies co-operating with the United States Signal Service, and number of stations on each line at which weather indications were posted for the benefit of the public on June 30, 1886.

Telegraph and telephone companies.	Number of stations.
Edison Mutual Telegraph Company	16
Michigan Postal Telegraph Company	8
Wisconsin Telephone Company	114
Union and Purcellville Telephone Company	7
Total	145

APPENDIX 11.

REPORT OF OFFICER IN CHARGE OF THE CORRESPONDENCE AND RECORDS DIVISION.

SIGNAL OFFICE, WAR DEPARTMENT,
Washington City, August 4, 1886.

SIR: I have the honor to inclose herewith, as usually furnished by the Correspondence and Records Division, for publication in annual report, the following, in duplicate in each case:

(1) List showing number of communications sent from and received at the Signal Office, Washington City (exclusive of telegrams), year ending June 30, 1886.

(2) List of stations inspected, year ending June 30, 1886.

(3) List of places for which stations have been requested, but not established, to June 30, 1886 (not printed).

(4) List showing meteorological data furnished persons for purposes specified, year ending June 30, 1886.

(5) List of boards of trade, chambers of commerce, and other organizations having meteorological committees to confer with the Chief Signal Officer, June 30, 1886.

Very respectfully, your obedient servant,

B. M. PURSSELL,
Second Lieutenant, Signal Corps, U. S. Army.

The CHIEF SIGNAL OFFICER, U. S. ARMY.

SIGNAL OFFICE, WAR DEPARTMENT,
Washington City, June 10, 1886.

SIR: In compliance with Memorandum No. 167, current series, I have the honor to submit the following concise report upon the work of the Correspondence and Records Division during the fiscal year ending June 30, 1886:

(*a*) The duties of this division embrace the record of, and action upon, all general and miscellaneous correspondence, including communications sent and received.

(*b*) Correspondence relative to, and supervision of, all examinations for enlistment.

(*c*) The recruiting for the Signal Corps.

(*d*) The promulgation of all instructions, general and special orders, and circulars issued by the Chief Signal Officer.

(*e*) See that the business of the service is conducted in strict accordance with the regulations, and to report all violations of orders and departures from the regulations to the Chief Signal Officer, and carry out his orders thereon.

(*f*) The examination and supervision of the medical accounts of the men of the Signal Corps and correspondence relative thereto.

(*g*) The preparation of data in pension cases of officers and enlisted men of the Signal Corps during the rebellion.

(*h*) Keep proper record of examinations and enlistments and personal histories of enlisted men of the Signal Corps and of the appointments, discharges, and resignations of civilian employés.

In relation to the foregoing, I have the honor to report that the general and miscellaneous correspondence of the office has been unusually heavy during the year, but as a rule has been conducted with dispatch, and in a manner satisfactory to all concerned, although at times the force on duty in the division has been insufficient to maintain that promptness and certainty of action so necessary to the transaction of business in the office. The general correspondence indicates unmistakably the increasing and pressing demands for a further extension and improvement of both branches of the Signal Service, meteorological and military. In the meteorological service the principal demands of the general public are for a more extended dissemination of the official predictions of the office, so as to embrace all the small cities, towns, and villages, and for the benefit of special industries, such as cattle-raising in the West, packing and shipping interests, &c.; demands for more stations in the interior of the country, and for special predictions relative to floods, cold waves, frosts, and other abnormal changes, the building of new sea-coast and military-telegraph lines, cable connections, &c.

Special attention has been given to correspondence and examinations relative to the enlistment of recruits for the Signal Corps, and the officer in charge has faithfully en-

deavored, and he believes with success, to carry out the wishes of the Chief Signal Officer that none but men of the highest order of physical and mental excellence attainable be secured for the vacancies in the ranks of the corps. All enlistments have been made under the strictest application of the civil-service principles embodied in the rules of the Chief Signal Officer governing this matter. The very limited number of instances of misconduct and neglect of duty on the part of the instructed men of the corps during the past year give evidence that the standard of *personnel* has about reached the maximum. The present state of efficiency can only be maintained by the strictest application of the present rules governing admission to the service. The following table shows the number of examinations, enlistments, promotions, discharges, reductions, deaths, &c., during the year:

Fiscal year ending June 30, 1886.

Candidates who submitted preliminary examination papers	47
Candidates who appeared for final examination	31
Men enlisted (thirty-eight of whom did not submit preliminary examination papers but were examined at office, Washington, D. C.)	69
Men instructed at Fort Myer in the full meteorological and field course	36
Men instructed at Fort Myer as military signalists	30
Promotions to grade of sergeant	32
Promotions to grade of corporal	33
Promotions to grade of first-class private	27
Reductions to ranks	15
Discharges	59
Deceased	4

The instructions and general and special orders of the Chief Signal Officer have been promulgated in printed form from time to time, numbered in separate series, and neatly bound in volumes at the end of the year.

As a general rule all persons in the service have rendered faithful service, have given ready compliance with the orders of the Chief Signal Officer, and there have been but few derelictions to report, and these of a minor character. Although the five hundred men of the corps are scattered throughout the whole territory of the United States, and many of them are required to serve in severe and unhealthy climates and perform the most arduous duties, yet the general health has been excellent, few cases of severe illness occurring, and, as above stated, only four deaths took place during the year. Most of the sickness was among the men on duty in the office of the Chief Signal Officer.

A considerable portion of the time of one clerk has been given to the preparation of data relating to pensions for officers and enlisted men of the Signal Corps during the rebellion. Attention is invited to the unsafe position of these and other valuable military records of the Signal Corps during the late war. These records are all stored in building No. 1721 G street. This building is not fire-proof, and is surrounded by other rickety buildings which may burn at any moment.

Careful record has been maintained during the year of the personal history of all members of the corps, so that the merits and demerits and all the particulars affecting the personal and official character of any individual can be placed before the Chief Signal Officer at a moment's notice.

During the year 143 stations of the Signal Service were carefully inspected by officers of the corps.

Very respectfully, your obedient servant,

B. M. PURSSELL.
Second Lieutenant, Signal Corps, U. S. Army.

The CHIEF SIGNAL OFFICER OF THE ARMY,
Washington, D. C.

APPENDIX 11A.

***Statement exhibiting the communications sent from and received at the Signal Office, Washington City (exclusive of telegrams) from July* 1, 1885, *to June* 30, 1886.**

SENT.

To heads of departments and bureaus	4,395
To non-commissioned officers in charge of stations, concerning their duties	19,155
In reply to applications for establishment of stations	117
To telegraph companies, in reference to transmission of weather reports, the erection of telegraph lines, &c	139

To boards of trade, chambers of commerce, &c	351
To foreign correspondents, relating to simultaneous weather reports	330
To foreign correspondents in general	150
To voluntary observers throughout the United States	10,860
Relative to enlistments, discharges, &c	1,479
Relative to publications	808
Data furnished	387
To postmasters, relative to farmers' bulletins, &c	188
To railroad companies, relative to establishing stations, furnishing indications, &c	231
To Fort Myer, Va., concerning duties and discipline at Signal Service school of instruction, &c	388
Relative to furnishing meteorological instruments, charts, books, forms, &c.	510
Relative to building, sale, repair, &c., of telegraph lines	197
To signal officers, relative to their duties	618
Orders, circulars, instructions, &c	56,500
To manufacturers and others, in reference to instruments, equipments, &c.	10,909
In reference to quarterly returns of officers, &c	2,799
Relative to furnishing indications and predictions	1,867
Miscellaneous	14,469
Total	126,847

RECEIVED.

From heads of departments and bureaus	8,273
Applications for establishment of new stations	43
From telegraph companies, in reference to the transmission of weather reports and the construction of telegraph lines, &c	396
From boards of trade, chambers of commerce, &c	322
From foreign correspondents	6,918
Surgeons' certificates	198
Examination papers (sets)	116
From enlisted men, in reference to their duties	10,122
Returns, accounts, descriptive lists, &c	925
From United States naval stations and vessels	1,188
From voluntary observers throughout the United States	10,860
From United States military posts (surgeons' reports)	678
Relating to duties and discipline at Signal Service school of instruction at Fort Myer, Va.	512
Relating to instruction in military signaling	317
Applications for enlistment	589
Instruction reports	2,244
Reports from railroad stations in reference to weather reports	17,808
Meteorological forms, &c., from stations	180,729
Reports from postmasters in reference to weather bulletins	4,220
Acknowledgments of orders, circulars, &c.	13,490
From manufacturers and others, in reference to instruments, equipments, &c.	2,804
From officers, concerning property and money accounts	22,880
Miscellaneous	10,827
Total	302,218
Total sent	126,847
Total sent and received	429,065

TELEGRAMS.

Cipher words or reports sent and received	1,774,995
Telegrams other than weather reports sent and received	80,590

APPENDIX 11 B.

Stations inspected during fiscal year ending June 30, 1886.

Place.	Inspected by—	Date of inspection.
Abilene, Tex	Lieut. W. D. Wright, Signal Corps	September 22, 1885.
Albany, N. Y	Lieut. J. P. Finley, Signal Corps	August 29, 30, 1885.
Alpena, Mich	do	September 15, 16, 1885.
Apache, Fort, Ariz	Lieut. R. B. Watkins, Signal Corps	October 27, 28, 1885.
Ash Fork, Ariz	do	September 15, 1885.
Atlanta, Ga	Lieut. L. E. Sebree, Signal Corps	May 6-8, 1886.
Atlantic City, N. J	Lieut. John P. Finley, Signal Corps	August 17, 1885.
Assinaboine, Fort, Mont	Lieut. F. R. Day, Signal Corps	September 4, 1885.
Augusta, Ga	Lieut. L. E. Sebree, Signal Corps	May 9, 10, 1886.
Bangor, Me	Lieut. J. H. Weber, Signal Corps	August 29-31, 1885.
Baltimore, Md	Lieut. J. S. Powell, Signal Corps	June 27-29, 1886.
Barnegat City, N. J	Lieut. J. P. Finley, Signal Corps	August 20, 21, 1885.
Bennett, Fort, Dak	Lieut. F. R. Day, Signal Corps	September 15, 1885.
Benton, Fort, Mont	do	September 3, 1885.
Bismarck, Dak	do	August 14, 1885.
Block Island, R. I	Lieut. J. H. Weber, Signal Corps	September 20-27, 1885.
Boston, Mass	do	September 14-18, 1885.
Bowie, Fort, Ariz	Lieut. R. B. Watkins, Signal Corps	October 17, 1885.
Brownsville, Tex	Lieut. W. D. Wright, Signal Corps	September 5, 6, 1885.
Buffalo, N. Y	Lieut. J. P. Finley, Signal Corps	September 3, 4, 1885.
Buford, Fort, Dak	Lieut. F. R. Day, Signal Corps	August 20, 1885.
Cairo, Ill	Lieut. J. C. Walshe, Signal Corps	September 22, 1885.
Cape Henlopen, Del	Lieut. J. P. Finley, Signal Corps	August 7, 8, 1885.
Cape May, N. J	do	August 15, 1885.
Cedar Keys, Fla	Lieut. L. E. Sebree, Signal Corps	May 20, 21, 1886.
Charlotte, N. C	Lieut. J. S. Powell, Signal Corps	June 8, 9, 10, 1886.
Charleston, S. C	Lieut. L. E. Sebree, Signal Corps	May 11-14, 1886.
Chattanooga, Tenn	do	April 23-25, 1886.
Cheyenne, Wyo	Lieut. J. C. Walshe, Signal Corps	September 2, 3, 1885.
Chicago, Ill	do	August 7, 8, 1885.
Chincoteague, Va	Lieut. J. P. Finley, Signal Corps	August 10, 11, 1885.
Cincinnati, Ohio	Lieut. J. S. Powell, Signal Corps	June 19-21, 1886.
Cleveland, Ohio	Lieut. J. P. Finley, Signal Corps	September 6, 7, 1885.
Columbus, Ohio	Lieut. J. S. Powell, Signal Corps	June 22, 23, 1886.
Concordia, Kans	Lieut. J. C. Walshe, Signal Corps	September 14, 15, 1885.
Custer, Fort, Mont	Lieut. F. R. Day, Signal Corps	August 28, 29, 1885.
Davenport, Iowa	Lieut. J. C. Walshe, Signal Corps	August 22, 1885.
Davis, Fort, Tex	Lieut. W. D. Wright, Signal Corps	September 23, 1885.
Deadwood, Dak	Lieut. F. R. Day, Signal Corps	September 23, 1885.
Denver, Colo	Lieut. J. C. Walshe, Signal Corps	September 3, 4, 1885.
Des Moines, Iowa	do	August 24, 25, 1885.
Detroit, Mich	Lieut. J. P. Finley, Signal Corps	September 12, 13, 1885.
Dodge City, Kans	Lieut. J. C. Walshe, Signal Corps	September 12, 13, 1885.
Dubuque, Iowa	[illegible]	August 20, 21, 1885.
Duluth, Minn	[illegible]	August 19, 1885.
Eastport, Me	[illegible]	August 25-27, 1885.
Elliott, Fort, Tex	[illegible]	October 7, 8, 1885.
El Paso, Tex	[illegible]	October 18, 19, 1885.
Erie, Pa	[illegible]	September 5, 6, 1885.
Escanaba, Mich	[illegible]	August 12, 13, 1885.
Galveston, Tex	[illegible]	August 24-26, 1885.
Grand Haven, Mich	[illegible]	September 19, 20, 1885.
Grant, Fort, Ariz	[illegible]	October 11, 12, 1885.
Greencastle, Ind	[illegible]	June 16, 1886.
Helena, Mont	[illegible]	August 31, 1885.
Huron, Dak	[illegible]	September 17, 1885.
Indianapolis, Ind	[illegible]	June 17, 18, 1886.
Indianola, Tex	[illegible]	August 27-29, 1885.
Jacksonville, Fla	[illegible]	May 17-19, 1886.
Keokuk, Iowa	[illegible]	August 23, 1885.
Key West, Fla	[illegible]	May 26, 27, 1886.
Knoxville, Tenn	[illegible]	August 10, 1885.
La Crosse, Wis	[illegible]	August 19, 1885.
Lamar, Mo	[illegible]	September 17, 1885.
Lava, N. Mex	[illegible]	October 19, 1885.
Leavenworth, Kans	[illegible]	September 15, 16, 1885.
Little Rock, Ark	[illegible]	August 15, 16, 1885.
Little Egg Harbor, N. J	[illegible]	August 19, 1885.
Los Angeles, Cal	[illegible]	September 21-23, 1885.
Louisville, Ky	[illegible]	June 13, 14, 1886.
Lynchburg, Va	[illegible]	August 9, 1885.
McDowell, Fort, Ariz	[illegible]	October 7, 1885.
Mackinaw City, Mich	[illegible] Corps	September 18, 1885.
Maginnis, Fort, Mont	Lieut. F. R. Day, Signal Corps	August 25, 26, 1885.
Marfa, Tex	Lieut. W. D. Wright, Signal Corps	September 16, 17, 1885.
Maricopa, Ariz	Lieut. R. B. Watkins, Signal Corps	October 6, 1885.
Marquette, Mich	Lieut. J. C. Walshe, Signal Corps	August 13, 14, 1885.
Marine Agency, Philadelphia	Lieut. J. P. Finley, Signal Corps	August —, 1885.
Marine Agency, New York City	do	August 26-29, 1885.
Memphis, Tenn	Lieut. W. D. Wright, Signal Corps	August 13, 14, 1885.

Stations inspected during fiscal year ending June 30, 1886—Continued.

APPENDIX 11 c.

Meteorological data were furnished 227 different persons during the year ending June 30, 1886, at their request, for the following purposes, viz.:

To be used in State or United States courts as evidence.

To be used in compiling works or publications on meteorology, hygiene, agriculture, manufactures, commerce, &c.

To assist in manufactures, the prosecution of the arts, and advancement of the sciences.

To settle questions as to the relations of meteorology and agriculture.

In deciding the cause and locating the responsibility in railroad and marine disasters.

In fixing the responsibility of damage to freight in transit by common carriers.

In acquainting immigrants with the climatology of districts open to settlement.

In informing invalids of the desirability of the meteorology of sections affecting their diseases.

Miscellaneous purposes.

APPENDIX 11 D.

List of boards of trade, chambers of commerce, and other organizations which had, on June 30, 1886, meteorological committees to confer with the Chief Signal Officer of the Army.

Place.	Name of organization.	Committees.
Albany, N. Y	Board of Trade	Charles B. Tillinghast, Edward A. Durant, J. Townsend Lansing.
Alpena, Mich	Board of Underwriters	Henry S. Seage, John N. Kelley, J. D. Holmes, B. F. Luce, Charles H. Luce.
Astoria, Oreg	Astoria Chamber of Commerce.	Dr. A. C. Kinney.
Atlanta, Ga	Chamber of Commerce	B. W. Frobel, J. T. Henderson, R. J. Redding.
Augusta, Ga	Augusta Cotton Exchange.	W. N. Mercier, F. W. Foster, W. W. Bussey.
Baltimore, Md	Board of Trade	George J. Appold, D. L. Bartlett, Germon H. Hunt, Frank H. Jenkins, D. T. Buzby.
Block Island, R. I		B. B. Mitchell, Ray S. Littlefield, Charles E. Perry.
Boston, Mass	Society of Arts	Prof. William H. Niles, Jacob A. Dresser, George L. Roberts.
Buffalo, N. Y	Merchants' Exchange	Nathan C. Simons, Frank W. Fiske, Charles H. Arthur.
Charleston, S. C	Chamber of Commerce	J. S. Murdock, F. W. Dawson, J. L. Sheppard.
Do	Merchants' Exchange	George W. Bell, T. Follett Ware, John Dougherty.
Charlotte, N. C	Chamber of Commerce	T. F. Drayton, S. A. Cohen, W. W. Flemming.
Chattanooga, Tenn	Iron, Coal, and Manufacturers' Association.	D. W. Chase, R. C. McRee, F. J. Bennett, Tomlinson Fort, G. M. Sherwood, L. M. Clark, A. S. Ochs.
Chicago, Ill	Board of Trade	W. S. Seaverns, George G. Parker, N. M. Neeld.
Cincinnati, Ohio	Board of Trade and Transportation committee.	T. F. Livezey, Geo. C. Clements, Chas. H. Law, Alexander Hill, A. M. Dolph.
Cleveland, Ohio	Board of Trade	R. K. Winslow, chairman; R. T. Lyon, Capt. W. B. Guyles.
Columbus, Ohio	do	Geo. W. Twiss, George Cole, C. W. Ross.
Concordia, Kans	do	B. H. McEckron, Theo. Laing, Prof. T. Sawhill.
Denver, Colo	Chamber of Commerce	Chas. F. Wilson, Herman Silver, C. H. Reynolds, J. D. Best, H. H. Metcalf.
Des Moines, Iowa	Board of Trade	J. P. Bushnell, secretary; S. A. Robertson, W. A. Warfield.
Detroit, Mich	do	T. P. Hall, J. W. Flynn.
Dubuque, Iowa	do	Dr. A. Horr, T. W. Ruete, S. M. Langworthy.
Duluth, Minn	do	Walter Van Brunt, Owen Farguson, Benj. R. Clarkson.
Erie, Pa	do	H. S. Jones, J. J. Wadsworth, H. Beckman.
Escanaba, Mich	City	John Power, John C. Van Duzen, Wm. R. Northup, J. H. Mead, W. W. Mulliken.
Grand Haven, Mich		Hon. Dwight Cutler, T. W. Kirby, William Wallace.
Huron, Dak	Board of Trade	John Cain, Augustine Dovis, Hon. Geo. W. Sterling.
Indianapolis, Ind	do	George W. Sloan, A. J. Halford, Jas. R. Carnehan.
Indianola, Tex		H. J. Huck, Emile Reiffert, David Lewis.
Jacksonville, Fla	Jacksonville Board of Trade.	Dr. A. S. Baldwin, Messrs Reed, Clark, Owen, and Fuerlie.
Key West, Fla	Board of Trade	M. L. Hellings, Dr. J. Y. Porter, G. F. Ferguson, Chas. Howe, J. Fogerty.
La Crosse, Wis	do	D. A. McDonald, John Rau, J. H. Sierman.
Leavenworth, Kans	do	Dr. R. J. Brown, Judge L. Hawn, L. Mayo.
Little Rock, Ark	Cotton and Produce Exchange.	Logan H. Roots, chairman; John C. Fletcher, John D. Adams, R. H. Farquhar.
Los Angeles, Cal	Los Angeles Board of Trade.	Eugene Germain, Vinton L. Mitchell, W. A. Clinton.
Louisville, Ky	Board of Trade	Wm. Cornwall, jr., J. B. Speed, Graham Wilder, J. A. Tanner, E. H. Bowen, Nick Frazer, R. M. Kelly.
Do	Polytechnic Society	E. A. Grant, M. D., LL. D.; Prof. J. A. Tanner, M. D.; Prof. H. W. Watson, Ph. D.

List of boards of trade, chambers of commerce, and other organizations, &c.—Continued.

Place.	Name of organization.	Committees.
Lynchburg, Va	Chamber of Commerce	R. H. T. Adams, Joseph Cohn, William Hunt.
Memphis, Tenn	Cotton Exchange	D. P. Hadden, John D. Milburn, J. J. Freeman, H. A. Hamilton, M. Gavin, James Yonge, L. A. Scarbrough, A. A. Paton, John Overlon, jr., B. J. Semmes.
Do	Merchants' Exchange	P. Phillips, John Weller, G. H. Peters.
Milwaukee, Wis	Milwaukee Chamber of Commerce.	John L. Hathaway, John B. Merrill, David Vance.
Mobile, Ala	Mobile Cotton Exchange	W. H. Gardner, Adolph Proskaner, D. F. Huger.
Do	Mobile Chamber of Commerce.	Hon. Peter Hamilton, W. H. Gardner, E. O. Zadek.
Nashville, Tenn	Merchants' Exchange	J. W. Hopkins, F. D. Hicks (chairman), H. W. Grantland.
New Haven, Conn	Chamber of Commerce	Henry G. Lewis, Johnson T. Platt.
New London, Conn	City of New London	James Fitch, George T. Marshall, H. S. Bartlett, E. A. Delaney, R. M. Walterman, Leonard Smith.
New Orleans, La	Cotton Exchange	James A. Renshaw, chairman; J. L. McLean, R. S. Day, J. P. Dobbins.
Do	Produce Exchange	J. T. Brodnax, H. J. Roman, C. H. Allen.
Do	Sugar Exchange	J. Barkley, B. M. King, W. B. Bloomfield, P. Lanaux, W. Henderson.
New York City, N. Y	Cotton Exchange	Walter T. Miller, James F. Maury, William P. Campbell.
Norfolk, Va	Norfolk and Portsmouth Cotton Exchange.	John N. Vaughan, Adam Tredwell.
Omaha, Nebr	Board of Trade	C. F. Goodman, F. Rosewater, G. C. Ames, Thomas Gibson, Joseph Barker.
Oswego, N. Y	Board of Trade	J. L. McWhorter, A. S. Failing, W. R. Hosmer.
Pensacola, Fla	Board of Trade and Exchange.	Hon. S. C. Cobb, Hon. I. M. Tarble, H. Baars.
Philadelphia, Pa	Philadelphia Maritime Exchange.	Charles Gibbons, jr., William A. Platt, J. E. Morse.
Pittsburg, Pa	Coal Exchange	Richard Barrows, M. E. Lynn, John W. Risher.
Portland, Me	Board of Trade	C. H. Farley, M. N. Rich, William Senter.
Portland, Oreg	Chamber of Commerce and Board of Trade.	Rev. Dr. George H. Atkinson, E. H. Page, George H. Himes.
Rochester, N. Y	Merchants' Exchange	John Siddons, H. S. Hebard, George Schofield.
San Diego, Cal	Society of Natural History.	Dr. G. W. Barnes, Dr. H. W. Gould, C. J. Fox.
Sandusky, Ohio	Board of Trade and city council.	J. O. Moss, C. N. Ryan, R. B. Hubbard.
San Francisco, Cal	Chamber of Commerce	William L. Merry, Jacob S. Tabor, W. W. Dodge.
Savannah, Ga	Savannah Cotton Exchange.	C. M. Holst, A. L. Hartridge, J. J. Wilder.
Shreveport, La	Cotton Exchange	H. R. Johnston, R. E. Jacobs, Henry Florsheim.
Saint Louis, Mo.	Merchants' Exchange	M. M. McKeen, C. L. Case, H. B. Jenkins, James E. Blythe, J. P. Burdean, R. E. M. Bain, F. E. Kauffman.
Do	Cotton Exchange	R. B. Whittemore, Henry Dureker, Chas. Bienonstock, William Mathews, C. A. Lawton, C. W. Simmons.
Do	Mechanics' Exchange	Daniel Evans, Anthony Ittnes, F. C. P. Feedermann, Thomas Rich, Thomas F. Hayden.
Saint Paul, Minn	Saint Paul Chamber of Commerce	R. O. Sweeney, Rev. David Breed, M. N. Kellog.
Toledo, Ohio	Toledo Produce Exchange	W. T. Carrington, Frank I. Young, W. Cummings.
Vicksburg, Miss	City	Thomas Mount, Dr. G. W. Howard, J. D. Tinney.
Wilmington, N. C	Chamber of Commerce	F. W. Kerchner, George Harriss, William L. DeRosset.
Yankton, Dak	City	J. C. McVay, chairman, president First National Bank; A. W. Barber, H. G. Clark.

APPENDIX 12.

ANNUAL REPORT OF THE OFFICER IN CHARGE OF THE STATIONS DIVISION.

SIGNAL OFFICE, WAR DEPARTMENT,
Washington City, June 30, 1886.

SIR: I have the honor to submit the following report on the work of the Stations Division during the year ending this day:

Owing to the extension of the various branches under the supervision of the Stations Division, the importance and amount of the work accomplished during this year have been in excess of that in any previous year.

The routine duties in the several subdivisions have been carefully and accurately performed and, notwithstanding that the clerical force has been reduced by four men, owing to the untiring perseverance of the men on duty in the division everything has been kept up, and the routine work is fairly well up to date.

So many requests for meteorological data have been received from boards of trade, cotton exchanges, corporations, and from other bureaus of the Government and the Mississippi River Commission, as well as for use in court, for publication, &c., &c., that, had all applications been favorably acted upon, at least ten clerks would have been kept constantly occupied in compiling the information from the records at this office. Consequently many persons had to be refused, and yet during the year the time consumed in preparing data for purposes not connected with the Signal Service was equal to the work of one clerk for three hundred and fifty-five days.

The river system has been enlarged, and new points of observation established at places selected by those most interested in river navigation, and reports of sudden rises and floods have been telegraphed and spread broadcast over the area likely to be overflowed or damaged in any way by high water. Much more could have been done in this direction if sufficient means for the purpose had been at the disposal of the Service.

Many river-gauges have been erected and replaced, but I regret to say that many others could not be given the attention their importance demanded, owing to the fact that the appropriation was insufficient. River observations are now taken at 95 regular and special stations.

The appropriation for this service for the fiscal year ending June 30, 1886, was not sufficient to meet all the needs of this branch of the service during that year, but in spite of this, valuable warnings were given to all flood-threatened districts, and, as a result, a vast amount of property was saved.

This work has proven to be of great value to the people living near our great rivers, and its extension to the smaller streams of the country, particularly on the Gulf and Atlantic seaboards, is loudly demanded by the people who have suffered from floods in those districts; but this is utterly impracticable without increased appropriations.

The cotton service has been continued as heretofore, but here again lack of money has caused serious embarrassment and prevented any great enlargement of the system. The period of observations had to be shortened ten days in order to provide for the payment of the special observers. Petitions and memorials from cotton exchanges, boards of trade, &c., and prominent business men, asking for the extension of this service on a basis of two hundred and fifty stations (payment by the United States of telegraphic tolls and compensation of observers at 50 cents per day) have been received and estimates in accordance with these recommendations submitted, but it is doubtful whether Congress will allow any increase. One hundred and fifty-five stations are now taking and telegraphing these reports over the telegraph lines of railroads, who give this service free of charge to the Government; but, while the establishment and maintenance of the cotton-region reports has given very valuable information to the people engaged in the cotton trade, it has also taught them how much more valuable the results would be if more reliable and complete data could be obtained. Any increase is, however, impossible without largely increased appropriations, so that, by paying for taking the observations and for the telegraphic service, reliability and promptness would be made certain.

The system of cautionary wind signals has received much attention this year, and it has been changed and greatly improved. While the new signal displays are yet only tentative, observers and shipping men generally agree that great advantages, unknown to the old style, will accrue from the new. The display of cautionary wind signals is now made at one hundred and sixteen points on the seaboard and great lakes.

The weather and temperature display inaugurated last year has met with marked success and seems to meet the popular wants in every way. The display is now made in three hundred and fifteen cities and towns in the United States. At least an equal number of places have applied for the daily weather predictions, which could not be furnished for the reason that this office had no money at its disposal to pay for the telegrams. At all places where these signals are displayed the flags are purchased from private funds subscribed for the purpose. It is estimated that several millions of people have been directly benefited during the year by the display of these daily forecasts. This office has received over fifteen hundred communications on the subject, all of which testified to their great value to the general public.

In addition to the three hundred and fifteen towns to which the messages are sent there is a vast number of villages and cities that receive this information through the medium of the press, the railroads, and the telephone companies, many of whom post indications daily at their stations. In many cases also the mails are used to transmit this information.

The cold-wave signal system has continued to grow in public favor, and many and favorable comments have been made by those whose property has been saved by the timely warnings. So flattering have been the reports on this subject, so great the value of the property saved by them, and so numerous have been the requests for these warnings of approaching cold weather, that the office cannot but consider the cold-wave system as one of the most important adjuncts of the Signal Service. Two hundred and eighty-nine cities and towns now receive the benefit of these warnings, and as the press, the railroád, telegraph, and telephone companies distribute these warnings, it is estimated that at least fifteen millions of people have received and been benefited by them.

Appendices (consisting of valuable meteorological tables and reports) are in course of preparation for the annual report, none of which could be omitted without injustice to the service.

In the face of reduced appropriations, which, if continued, threaten in the near future to badly cripple this service, its field of usefulness has constantly widened and its work increased day by day until it stands at present the only institution of its kind in the world that by its work saves to the people who receive its benefits annually more than its cost to the Government a hundred-fold. The vast commercial, shipping, and agricultural interests of this country demand that its scope be greatly enlarged; and to this is added the voice of humanity, for its work often results in the saving of human life.

Very respectfully, your obedient servant,

F. R. DAY,
Second Lieutenant Signal Corps, U. S. Army.

THE CHIEF SIGNAL OFFICER OF THE ARMY,
Washington, D. C.

APPENDIX 13.

ANNUAL REPORT OF THE OFFICER IN CHARGE OF THE TELEGRAPH DIVISION.

The regular tri-daily cipher weather reports were received during the year over the wires of the Western Union, International Ocean, Florida, Gulf Coast, and Northwestern Telegraph Companies.

One million seven hundred and seventy-five thousand cipher words of weather reports were received at, and sent from, this office during the year. Eighty thousand five hundred and ninety telegrams other than weather reports were sent and received during the same period.

UNITED STATES MILITARY TELEGRAPH LINES.

There were in operation at the beginning of the year 2,781 miles of military telegraph lines under the control of the Chief Signal Officer, with seventy-seven offices at, or in connection with, military posts on the frontier, and operated with a few exceptions by enlisted men of the Signal Corps.

These lines were distributed among the several departments, as follows:

	Beginning of year.	End of year.
	Miles.	*Miles.*
Department of Dakota	803	740
Department of the Missouri	582	582
Departments of the Columbia and California	512	444
Department of Arizona	510	510
Department of Texas	199	124
Department of the Platte	85	85
Total	2,781	2,485

No new lines were built except to shorten the existing line connecting Fort Totten, Dak., with the commercial wires. In this case a line 7 miles long was built from Lakota, Dak., to a point on the old Larimore line, about 35 miles from Fort Totten, and the line east of that point abandoned and sold. The new connection was completed October 20, 1885, reducing the distance from the post to the transfer office to 42 miles, against 68 miles by the old route.

The line between Forts Yates and Sully, Dak., 123 miles long, was abandoned during September, 1885, and sold at public auction. This line stood in need of extensive repairs, which its small value to military interests did not justify the expense of, as both posts have independent telegraphic outlets.

It having been found impossible to maintain the long span across the Missouri River between Fort Sully and Bennett, Dak., and there being in the opinion of the Department Commander no urgent necessity for maintaining a line between those posts, the proposition to build a new crossing and make other necessary changes was not carried into effect. The line was formally abandoned in October, 1885, and sold at auction.

The abandonment of the post of Fort Lapwai, Idaho, by the military forces rendered the further maintenance of the telegraph line from that post to Dayton, Wash., unnecessary. It operation was discontinued November 30, 1885, and the line sold at auction January 16, 1886.

The last abandonment of lines during the year was made June 30, 1886, when the operation of the line between Fort Stockton and Davis, Tex., was discontinued in consequence of the abandonment of the post of Fort Stockton. The iron poles in use on that section will be recovered and the remaining material sold at auction.

To sum up: There were in operation at the beginning of the year 2,781 miles of line; new lines built during the year, 7 miles; abandoned, 303 miles; leaving 2,485 miles in operation at the present date.

The following is a brief description of the lines in the several departments:

Department of Dakota.—The lines are operated as detached sections under the supervision of the chief operators. The Bismarck section, 55 miles long, affords telegraphic communication with Forts Abraham Lincoln and Yates. It is in good condition and has worked with a total interruption of but nine days for the entire year.

The Fort Maginnis section, 367 miles, extends from Glendive, Mont., to Fort Maginnis, via Fort Buford and camp on Poplar River. The line has worked remarkably well, considering the rough and desolate country through which most of it passes, and the great length of the repair sections. A few new poles and the resetting of some old ones will keep this section in good condition for another year.

The Fort Assinaboine section, 208 miles, connects Forts Assinaboine, Benton, and Shaw with the commercial lines at Helena, and is much employed for commercial as well as military business. The total interruption due to breaks and other causes amounted to twenty-nine days and thirteen hours for the entire year. The projected construction of railroads and private lines will probably lead to the sale of this section at an early date.

The Fort Custer, Fort Totten, Fort Sisseton, and Fort Meade sections are short lines connecting each post with the nearest commercial office; the last-named two are equipped with telephones. The change made on the Fort Totten line has already been referred to.

Department of the Missouri.—The several detached sections in this department are as follows:

The Indian Territory section, 438 miles, extends from Dodge City, Kans., to Henrietta, Tex., and furnishes telegraphic outlets to the posts at Fort Supply, Fort Elliott, Cantonment, Fort Reno, and Fort Sill. The military necessity for this line was well illustrated last summer during the Indian and cattle troubles. The line has worked with little more than ordinary interruptions—such as all telegraph lines are liable to—and as it has an outlet at each end, there has been very little delay of business on account of breaks. Very extensive repairs were made to the entire section by troops from the several posts under the supervision of the general repairman, resulting in the erection of a large number of iron poles in the place of the wooden ones, and the construction of more durable spans across rivers. It is proposed to gradually replace all wooden poles with iron ones on this section. The greater part of the line in Kansas runs through lands which have been fenced in during late years, and it will be necessary to move the line so it can be patrolled without difficulty.

The Fort Stanton section, 108 miles, is in excellent repair, and, with the exception of 26 miles, built entirely of iron poles. About six hundred of the latter were put in during the past year, and the whole section received general repairs on two occasions. Most of the remaining wooden poles are of good quality cedar, and will last some time longer. Iron poles will eventually be used on the whole section. The total number of days on which the line was interrupted from all causes was nineteen.

The Fort Bridger section, 10 miles, was entirely rebuilt with iron poles during November, 1885, and is in excellent condition.

The Fort Union, Fort Wingate, Fort Lewis, and Uncompahgre sections are short lines, some of them equipped with telephones, and connect these posts with the nearest railroad telegraph offices. No commercial business is carried over these lines, and their local management is in the hands of the post commanders.

Department of the Columbia and California.—The lines in these departments, excepting the Spokane Falls section, met with frequent interruptions during the past winter, due partly to severe storms and high tides, and partly to the manner of their construction.

The Fort Klamath section, 233 miles, extends from Ashland, Oreg., via Fort Klamath, Oreg., to Fort Bidwell, Cal., and for a distance of 138 miles runs through a densely timbered, mountainous country, where the wire had to be strung on trees for long distances. Forest fires, high winds, and falling timber cause frequent damage to the line and make this the most difficult section to keep in repair. Strong details from Forts Klamath and Bidwell made extensive general repairs on several occasions during the year, but nothing could be done with the means at command to remove the natural defects and obstacles of a line through such a country. The abandonment of Fort Klamath as a military post on June 30, will still further increase the difficulty of keeping this line in repair, but the line will have to be maintained in the best manner possible, as it furnishes the only outlet for Fort Bidwell.

The Fort Canby section, 28 miles, including 5 miles of cable, worked well until November, when the line on the Washington Territory side of the Columbia River was almost completely wrecked by high winds and washouts. A continuance of bad weather during the winter caused many interruptions, principally due to the washing away of

the beach near Scarboro Head. Work is now in progress moving that part of the line back from the beach and out of the reach of storm tides.

The Cape Flattery section, 80 miles, extends from Port Angeles, Wash., to Tatoosh Island, Wash., a cable 2 miles long connecting the island with the mainland. This line also runs through a densely-wooded wilderness, and is therefore subject to many interruptions, which, however, can always be promptly repaired from the intermediate repair stations.

The Fort Canby and Cape Flattery sections are of great value to commercial interest in reporting the arrival and departure of vessels.

The Spokane Falls section, 91 miles long, connects the posts of Fort Cœur d'Alene, Idaho, and Fort Spokane, Wash., with the transfer office at Spokane Falls. This section has worked well and with but very few interruptions, and is generally in good condition. A large portion of the line west of Spokane Falls runs through fenced-in lands, which greatly impedes the making of necessary repairs. It is proposed to move that part of the line so as to follow the new stage road. The necessary poles and material are now being collected for this purpose.

The San Francisco harbor line and cables connect the division headquarters at the Presidio with Alcatraz and Angel Islands, and with the posts of Fort Mason and Fort Winfield Scott. The submarine cable between the Presidio and Alcatraz Island, which on December 31, 1884, was for the second time broken by a ship's anchor, was recovered and relaid from Fort Mason during the following September, a want of funds preventing earlier action. At the same time the surplus cable on hand was laid from Angel Island across Raccoon Strait to Point Tiburon, where connection was made with the Western Union wires. This secured a second means of communication with the islands. On March 26, 1886, the Alcatraz cable was for the third time broken by an anchor, making it evident that a direct cable between Alcatraz and the mainland cannot be maintained. It is now proposed to relay this cable from Fort Winfield Scott to Lime Point, and build a land line thence to Point Tiburon, thus securing direct connection with Angel and Alcatraz Islands, via the cables from Point Tiburon to Angel Island, and from the latter to Alcatraz Island.

Department of Arizona.—Lieut. R. B. Watkins, Signal Corps, has remained in charge of the lines in this department during the year, and reports that all sections have been kept in exceptionably good condition at a very small expense, and that the department and post-commanders are entirely satisfied with the efficiency of the military telegraph. Every mile of line on both the Prescott and Fort Apache sections was gone over and thoroughly repaired during the year. More than 800 iron poles and 400 wooden poles were erected, and hundreds of wooden poles reset.

The Fort Apache section is 216 miles long, and extends from Fort Apache to Fort Bowie, Ariz., with offices at Fort Thomas, San Carlos Agency, Fort Grant, and Willcox, Ariz. Owing to the great military importance of this line during the Apache Indian troubles, the department commander recommends the construction of an additional outlet from Fort Apache to Holbrook, Ariz. This line can be built from material on hand, if troops can cut the poles and do the other necessary labor.

The Prescott section, 280 miles long, extends from Ash Fork to Maricopa, Ariz., and affords a telegraphic outlet, at either end, to department headquarters at Whipple Barracks, and to Forts Verde and McDowell.

Both sections are largely built of iron poles, and are in excellent condition.

Two short telephone lines, operated by the post authorities, connect Forts Lowell and Huachuca with the nearest railroad offices.

Department of Texas.—The two sections in this department were under the control of the chief operators until June 1, 1886, when Lieut. L. E. Sebree, Signal Corps, assumed charge of them.

The Brownsville section, 100 miles, extends from Rio Grande City, along the Rio Grande River, to Brownsville, Tex., and connects Fort Brown with Fort Ringgold, and with the subposts at Edinburg and Santa Maria. This line is almost entirely on iron poles and has worked satisfactorily during the year. A general repair party will give it a thorough overhauling during the present summer.

The Fort Davis section, up to June 30, 1886, connected Forts Stockton and Davis with the transfer office at Marfa, Tex., a total distance of 97 miles. The abandonment of the line from Fort Stockton to Fort Davis on June 30, already referred to, reduces the length of this section to 22 miles, all of which is on iron poles and in excellent condition.

A short line, operated by a Signal Corps man, connects department headquarters with the Western Union office at San Antonio.

Department of the Platte.—The line from Fort Robinson, Nebr., to Fort Laramie, Wyo., is the only military line in this department that is operated by the Signal Service. It is in excellent condition and has worked throughout the year with but very few inter-

ruptions. The completion of the railroad wires to and beyond Fort Robinson will permit of the abandonment of this section at an early date.

Mention was made in the last annual report of the proposed construction of two new lines of telegraph during the coming fiscal year, viz.: From Fort Gaston, Cal., to Mad River, Cal.; and from Fort Halleck to Halleck Station, Nev.; but Congress having failed to appropriate the money for this purpose, no action can be taken at present.

The total receipts from tolls for commercial messages transmitted over the military telegraph lines during the year amounted to $13,203.81; in addition $22,324.31 was collected at military offices for tolls due the connecting commercial lines.

THE SEA-COAST TELEGRAPH LINES.

Owing to the very small appropriation available during the year for the sea-coast lines, nothing could be done towards rebuilding those sections on the New Jersey and North Carolina coasts which had become unserviceable from age and other causes. The lines between Cape Henlopen, Del., and Chincoteague, Va.; Norfolk, Va., and Kitty Hawk, N. C., and between Wilmington and Smithville, N. C., were maintained in operation throughout the year. Direct communication between Kitty Hawk and Wilmington had already ceased since March 3, 1885, owing to a break in the Hatteras cable, and during April, 1886, the repair of the land lines between those points had also to be suspended for want of funds. The Great Egg Harbor (N. J.) cable broke on September 5, 1885, disrupting communication between the two most important offices on that line, and as there was no money to make repairs, the entire line from Barnegat City to Cape May, N. J., was provisionally turned over to the Life-Saving Service for use as a telephone line.

The Block Island cable broke October 14, 1885, and although an urgent deficiency appropriation of $5,000 was made by Congress to repair it, its condition was found to be such that nothing short of a new cable can restore communication.

The only addition to the sea-coast lines during the year was the construction of a line of telegraph and submarine cables connecting the island of Nantucket with the mainland via Martha's Vineyard. The cables, 23 miles in length, were laid in November, 1885, and the land lines completed on April 30, 1886. Galvanized iron poles were used for the latter, and a double wire was strung on both islands to permit communication by telephone as well as by Morse instruments. The total length of line and cables is 61 miles.

REPORT ON FROST WARNINGS.

Annual report of telegraph division, 1885-'86.

The system of special frost warnings for the benefit of tobacco, cranberry, sugar, and fruit growing districts was continued in operation as organized in 1882.

Upon the urgent application of cranberry growers a new district was added, with Milwaukee as the center of distribution, covering the cranberry marshes in the central counties of Wisconsin, where some 10,000 acres of marshes are under cultivation, producing an average annual crop of 50,000 barrels, valued at from $7 to $10 per barrel.

The greatest enemy to the cranberry plant is frost. Various methods have been tried to protect the plant, but the only successful one, and the one now generally applied by all the large growers, is to flood the marshes to the depth of several inches and keep the water in motion. A majority of the cranberry marshes in the country can be thus protected if the grower has from ten to twelve hours' notice of approaching frost. But as this precaution involves more or less expense, trouble, and loss of time, especially during the picking season, it is necessary to use great caution in making frost predictions for the benefit of this industry. An unnecessary alarm may also exhaust the water in the reservoirs which would be needed for a subsequent occasion of real danger. The large producers during the season of danger keep some one constantly on duty at the sluices, who, by observing the temperature and noting conditions favorable to frost, can often anticipate the danger by flooding the meadows. To such the frost warnings issued from this office are of special value, since they are generally in advance of local indications of approaching frost, and by putting the grower on his guard cause him to watch his own instruments more closely to determine whether or not the danger is imminent for his own particular locality.

The entire frost-warning system now embraces twenty-seven centers of distribution to which the warnings are sent from this office, and eight hundred and twenty-two frost stations where the warnings are bulletined and otherwise disseminated as soon as received from the centers. With the ready and efficient co-operation of the railroad and telegraph companies a system of telegraphic circuits has been established for each center, by means of which the warnings can be distributed with the least possible delay. The great

drawback lies in the fact that rapid distribution is necessarily limited to points at or near telegraph stations, but it is expected that with the growing organization of State weather services a more general distribution of frost warnings, by means of signals or by courier, will be gradually provided for.

The tobacco-growing districts to which warnings are sent are located in the western half of Massachusetts, the State of Connecticut, a portion of Southern New York, the eastern half of Pennsylvania, Central Maryland and Virginia, the western halves of North Carolina and Tennessee, the State of Kentucky, Southern Ohio and Indiana, Eastern Missouri, and the southern part of Central Wisconsin.

Cranberry interests are protected in Central Wisconsin, in Barnstable County, Massachusetts, and along the Camden and Atlantic Railroad in New Jersey.

Frost warnings for the benefit of sugar-growers are distributed in Louisiana from New Orleans as a center, and the fruit-growers of Florida receive warnings from Jacksonville and Sanford. Special messages are also sent from this office to points in North Carolina, South Carolina, Tennessee, and Texas.

There is relatively but little data on hand in the telegraph division from which to determine the actual amount of benefit derived from these warnings; but it is known that their great usefulness is generally acknowledged, and that with increased facilities for distribution and a wider knowledge of the system by those whom it seeks to benefit, their value to the farmer and planter will be immense. Subjoined are some extracts from letters by fruit, cranberry, and tobacco growers received during the year:

From Mr. J. E. Ingraham, president of the South Florida Railroad Company:

"Through your kindness in sending us frost warnings and weather bulletins last winter, there were no doubt many thousand dollars' worth of fruits and vegetables saved that would otherwise have been destroyed. * * * On the 8th instant (January, 1886), thirty-six hours before the late freeze, we had a telegram from you, as follows: 'Decidedly colder freezing weather to-night in Northern Florida, Alabama, and Tennessee, with a severe cold wave which will overspread the South Atlantic States and Florida during Saturday, and on Sunday damaging frosts as far south as Tampa Bay'—which was promptly bulletined at all telegraph stations on our line." * * *

From Mr. G. R. Morrison, of Tomah, Wis.:

"It would be a difficult matter to determine to an accurate degree the benefits derived from the frost warnings issued to cranberry districts last season. * * * It is safe to say that not less than 10,000 barrels of berries were saved during the season by growers being able to know when frosts would occur. A failure to receive notice of heavy frost would result in heavy damage."

From Mr. C. L. Waite, of Mather, Wis.:

* * * "Messrs. Hoffman, Brooks, Janes, and others say that the Signal Service report was undoubtedly a benefit. Cannot say definitely when it was a benefit, but saved their entire crops at several different times last year from heavy frosts (8,000 barrels)." * * *

From Mr. C. E. Morgan, Madison, Wis.:

"The warnings proved useful on my marshes; they were modified by our hygrometers, which we found a great aid for locality. * * * From my observation and consultation with growers I cannot entertain a doubt but if continued the service will become most useful to the State."

From Mr. A. C. Brooks, of Norway Ridge, Wis.:

"The frost reports were of great value to the cranberry growers of this locality. Having the report of the frost saved my entire stock of cranberries last season (which was 2,100 barrels), and think others are of the same opinion."

The following extract from a letter by Mr. A. C. Mills, of the Millsonia marsh, dated Madison, Wis., March 23, 1886, illustrates the difficulty of making frost predictions for a district so as to cover every locality in the district, viz.:

"The frost warnings were very beneficial where parties had facilities for fighting frost. In my own case the predictions did not come true, except twice, but my neighbors, both southwest and northeast, got hurt pretty bad three or four times, I presume the reason was because there was more fog at my place."

From Mr. L. G. L. Kniffen, of Milwaukee:

"We received the frost warnings at Lafayette, Monroe County, regularly. * * * We flooded the Kniffen and Stillwater marshes five times before picking. Three times there were injurious frosts when warnings were sent. Of the severest frost, we received a warning in the middle of the warmest afternoon of the fall, when by our judgment we could not have expected frost or been prepared. In this case, except for this warning, we might have lost about 1,200 bushels of fine cultivated berries. Mr. Farrar, of Lafayette, had a large amount of sorghum cane in our vicinity; he watched the signals and smudged his cane four nights to save it. The last time the signal came he had burned all of the stumps and wood gathered, and had not the material wherewith to

protect his crop, and lost it. In his case the warnings were timely, his lack of preparation being the only difficulty."

From Mr. G. B. Sacket, of Berlin, Wis.:

"The frost warnings were of great value to me last fall, and also to a number of other cranberry growers in this vicinity. * * * Twice during last September the warnings were the means of my saving by water at least $10,000 to $15,000 worth of cranberries. * * * Should say that any year when there is an average crop there could be saved any one night $100,000 to $150,000 worth of cranberries on the marshes in this vicinity."

From Mr. Polk Prince, of Guthrie, Ky.:

"Your frost warnings are quite a benefit to tobacco raisers. It has been a very great benefit to us this fall; got notice in time to save remnant of crop from frost."

From Mr. F. S. Adams, Henderson, Ky.:

"The frost warnings sent to this place have been correct in every instance this season. They are of special importance to the tobacco interests in this locality, Henderson being the center and market of one of the largest tobacco-growing countries in the world."

From Mr. F. J. Garrott, of New Providence, Tenn.:

"I was able by your frost warnings to secure all my crop in proper time without damage, and consider them valuable to the farmer."

The above represent only a few of the many commendatory reports received from planters and others interested, but they sufficiently indicate the vast value of the crops that are protected by the present frost-warning service, limited, as it is, in most cases, to the immediate vicinity of telegraph stations. The expenses are trifling in comparison, being confined to the cost of the telegrams at one-half the usual Government rates, and to that of the blanks on which to bulletin the warnings. It would be impracticable for this office to provide for a distribution of the warnings beyond the telegraph and railroad offices, but the formation of local organizations for this purpose should be encouraged. To this end it is recommended that posters be prepared and widely distributed, explaining the object of the frost warnings and the manner of their telegraphic distribution, and urging upon those interested the importance of local co-operation in our efforts to give them the widest possible dissemination. A judicious distribution of Signal Service Notes No. III, "To Foretell Frost," especially among the cranberry growers, is also recommended. These notes will prove a most valuable adjunct to the growers, local observations, and will encourage others to provide themselves with hygrometers as a means of qualifying the general predictions sent from this office.

Respectfully submitted.

F. R. DAY,
Second Lieutenant, Signal Corps, U. S. Army.

OFFICE OF CHIEF SIGNAL OFFICER,
July 21, 1886.

APPENDIX 14.

ANNUAL REPORT OF THE PROPERTY AND DISBURSING OFFICER.

SIGNAL OFFICE, WAR DEPARTMENT,
Washington City, July 1, 1886.

SIR: I have the honor to submit the following statement of the work of the Property Division for the fiscal year ending June 30, 1886:

PERSONNEL.

On July 1, 1885, as per S. O. Nos. 134 and 138, A. G. O., 1885, I relieved Capt. S. M. Mills as Property and Disbursing Officer of the Signal Service.

SALES OF MAPS.

One hundred and ninety-one dollars and eighty-nine cents have been received during the year from sales of maps and bulletins, as allowed by the act of Congress approved March 30, 1874, section 227, Revised Statutes.

PAY ACCOUNTS OF THE MEN.

In the settlement of accounts room, the pay accounts of the entire corps have been examined and prepared for settlement, aggregating 15,830 accounts.

Under instructions No. 7, S. O., 1886, Second Lieut. J. C. Walshe was detailed as mustering officer, and to him the examination and preparation for settlement of the pay accounts of the corps were turned over.

OTHER ACCOUNTS SETTLED.

The number of accounts growing out of the disbursements of the regular appropriations expended by this office, settled during the year, has been 7,152, making an average number per month of 596 accounts. This was caused by the large number of stations, and the character of the accounts incurred at each; they being for small items of rent, hire, &c., which required monthly or quarterly settlements.

IMPROVED MODES.

The improved modes of administering the duties of this division inaugurated by my predecessor have continued, together with some changes made during the year in order to make the accounts more explicit and technically correct.

It is thought that the accounts now made up and rendered will be satisfactory to the accounting officers of the Treasury Department, and stand the very critical scrutiny which they undergo.

In this connection I would state that no report has been received from the Treasury Department of the examination of the accounts of Capt. S. M. Mills, my predecessor, since March, 1884, inclusive, and no report whatever has been received as to the result of the examination of my accounts.

Section 273 of the Revised Statutes, third paragraph, requires the Second Comptroller to report to the Secretary of War the official forms to be used in the different offices, for disbursement of public money in said offices, and the manner and form of keeping and stating accounts of the persons employed therein.

The Second Comptroller, so far as this office is concerned, has never notified to us the official forms to be used.

HOW PAYMENTS ARE MADE.

One of the reforms instituted by my predecessor was to pay all vouchers by checks drawn to order, and in no case to bearer, that mode being considered the safest, not only

in transmitting money, but it also furnished assurances that the money reached the persons in whose names the checks were drawn for payment. The plan has proved eminently satisfactory.

PURCHASE OF INSTRUMENTS BY PRIVATE PERSONS.

The advantages afforded to obtain greater accuracy by having instruments compared with our standards, for which no extra charge is made, still continues to induce many private persons, institutions of learning, &c., whose voluntary work is of great benefit to this service, to purchase instruments through this office, and during the year there have been 280 instruments of various kinds purchased, representing a total cost of $1,907.25.

These transactions have no connection with the public funds disbursed by me; this office simply acts as the agent of the manufacturer.

INSTRUMENTS PURCHASED FOR OFFICIAL USE AND ISSUED.

One thousand two hundred and fifty-one instruments of various kinds have been purchased during the year for the use of this service, and 1859 instruments have been issued since last report.

AVERAGE COST OF MAINTAINING STATIONS OF OBSERVATION.

The average cost of maintaining each station of observation during the year, including the cost of printing stations and additional cost of life-saving stations, but exclusive of the cost of telegraph service, and the pay and allowances of the men on duty at each, has been $283.88.

CORRESPONDENCE.

The total number of letters received during the year was 42,376, an increase over last year of 4,422 letters.

The total number of letters sent was 41,721, and the total number of indorsements 3,044, being an increase of letters sent of 8,725.

Attention is invited to this large increase of correspondence, which, as it represents the labor performed in this division, fully explains why I have on several occasions made application for an increase in the clerical force of the division. In order to keep the work up, it requires a constant strain upon every one connected with the division.

SHIPMENTS.

In the packing and shipping room there were 14,672 distinct shipments made, through the Quartermaster's Department, by mail and by express, with but few losses.

PACKAGES RECEIVED.

There were received during the year 6,099 packages.

MACHINE SHOP.

The usual quantity of work has been done in the machine shop in the manufacture and repair of meteorological instruments and repairs about the office.

CARPENTER SHOP.

The carpenter shop has been kept busy in making the necessary boxes for shipping supplies, &c., and jobbing and repairs about the office.

On October 7, 1885, this office made request for 7,000 feet of lumber on the War Department, to be paid from the appropriation "contingent expenses." This estimate was returned by the Secretary of War with the information that, as the lumber was to be used for packing signal property for shipment to the various stations in the field, the impropriety in the purchase of the lumber for such purpose from the contingent appropriation was evident, and the request was therefore disapproved.

In this connection a letter was addressed to the Secretary of War on October 26, 1885, inviting his attention to the fact that in estimating for the appropriations the item for lumber was included in that for contingent expenses, and nowhere else; it being considered that as the material would be used here and made up into boxes, it belonged properly to that class of expenditures. The decision of the Secretary of War, however, that it was not a proper charge against the appropriation was maintained, and conse-

quently the lumber for making packing-boxes was purchased from the appropriation "observation and report of storms."

A separate estimate for this item, however, was submitted for the fiscal year ending June 30, 1887.

LIBRARY.

The library has received during the year, by purchase, exchange, or gift, 797 volumes, and now contains 10,540 volumes.

APPROPRIATIONS.

The condition of the appropriations (disbursed by this office) for the fiscal year ending June 30, 1886, with expenditures thereunder, and balances, with probable demands on such balances, as required to be rendered by the act of Congress approved May 1, 1829, is as follows:

APPROPRIATED.

Observation and report of storms	$246,000 00
Signal Service	5,500 00
Maintenance and repair of military telegraph lines	24,000 00

EXPENDED.

Observation and report of storms	96,019 72
Signal Service	2,511 32
Maintenance and repair of military telegraph lines	20,263 53

BALANCES.

Observation and report of storms	149,980 28
Signal Service	2,988 68
Maintenance and repair of military telegraph lines	3,736 47

PROBABLE DEMANDS.

Observation and report of storms	126,980 28
Signal Service	2,988 68
Maintenaace and repairs of military telegraph lines	3,736 47

The amounts appropriated under the different heads for the support of the Signal Service, United States Army, for the fiscal year ending June 30, 1886, are as follows:

Legislative, executive, and judicial:	
Regular clerks, messengers, &c	$10,660 00
Scientific experts, clerks, &c	40,000 00
Postage stamps, postal union countries, allotted by the Secretary of War	1,069 00
Stationery, allotted by the Secretary of War	4,108 00
Rent of buildings for Signal Office	7,500 00
Contingent expenses, allotted by the Secretary of War	7,417 49
Total	70,754 49
Sundry civil expenses—observation and report of storms:	
Manufacture, purchase, and repair of instruments	10,000 00
Telegraphing reports	138,000 00
Expenses, storm signals	11,000 00
Cotton-belt reports	7,000 00
Connection life-saving stations	1,500 00
Instrument shelters	2,000 00
Rents, &c., of offices outside of Washington	41,500 00
River and flood reports	10,000 00
Maps and bulletins	25,000 00
Total	246,000 00
Maintenance and repair of military telegraph lines	24,000 00

Pay, &c., of the Signal Corps:	
Pay of officers	$33,750 00
Pay of enlisted men	200,151 51
Mileage to officers	5,000 00
Pay of contract surgeons	1,200 00
Commutation of quarters to officers	7,200 00
Total	247,301 51
Subsistence Department:	
Subsistence and commutation of rations, Signal Corps	155,000 00
Quartermaster's Department:	
Regular supplies:	
Fuel	6,200 00
Commutation of fuel, at $9 per month	23,760 00
Commutation of fuel, at $8 per month	23,040 00
Forage for mules and horses	3,100 00
Forage for officers' horses	1,495 00
Stationery	100 00
Stoves, and repairs to heating apparatus	400 00
Lights	150 00
Straw for animals	217 00
Straw for officers' horses	109 20
Straw for bedding	67 20
Total	58,638 40
Incidental expenses:	
Horse and mule shoes	500 00
Shoes and shoeing officers' horses	234 00
Blacksmiths' and other tools	300 00
Veterinary supplies	300 00
Fire apparatus, disinfectants, &c	200 00
Office furniture, Fort Myer	100 00
Total	1,634 00
Interment of officers and men	200 00
Apprehension of deserters	120 00
Transportation:	
Materials and funds	25,000 00
Officers and men	8,875 00
Means of, mules	1,000 00
Means of, harness	130 00
Means of, repairs to	500 00
Total	35,505 00
Barracks and quarters:	
Commutation of quarters	84,108 00
Work and supplies at Fort Myer	1,500 00
Total	85,608 00
Clothing, camp, and garrison equipage:	
Six wall-tents, &c	73 89
Issues in kind	2,800 00
Total	2,873 89
Medical department:	
Medical attendance and medicines, officers and men, Signal Corps	5,000 00
Medical attendance and medicines, officers with Signal Corps	100 00
Medical and hospital supplies, Fort Myer	700 00

Medical department—Continued.	
Medicines from depots, &c	$1,000 00
Materials, repairs to hospital, Fort Myer	300 00
Total	7,100 00
Ordnance, &c., Fort Myer	100 00
Printing and binding allotted by the Secretary of War	14,000 00
Support of the Army:	
Expenses Signal Service, U. S. Army	5,500 00
Grand total	954,335 29

CLERICAL FORCE.

On July 1, 1885, there were employed in this division 67 men, 35 enlisted and 32 civilian; the latter including messengers and laborers.

On June 30, 1886, there were employed in this division 69 men, 44 enlisted and 25 civilian; the latter including messengers and laborers.

The above shows an increase of 9 enlisted men and a decrease of 7 civilians.

TELEGRAPH STATIONS.

At the close of the fiscal year ending June 30, 1885, there were 74 telegraph stations in operation. Thirteen have been closed during the year, 5 transferred to Lieut. L. E. Sebree, Signal Corps, U. S. A., and 5 added, making a total of 61 stations in operation June 30, 1886, reporting to this office.

LINE RECEIPTS.

The receipts from the 74 stations during the year were $21,258.48, of which the sum of $10,094.06 was collected for and paid to other lines. This latter includes the business done up to and including March 31, 1886.

On March 12, 1886, the Secretary of War rendered a decision directing that instructions be issued to all officers or others receiving private messages for transmission over private lines to keep all receipts for such messages, and to render accounts therefor separate and distinct from receipts for private messages over Government lines. The money thus received should be promptly paid to the proper parties, as has been the custom heretofore.

FREE BUSINESS.

The money value of free business (official messages), if paid for, would have been $12,817.93.

REMARKS ON APPROPRIATIONS.

On January 25, 1886, the Second Comptroller of the Treasury Department published a memorandum criticising the disbursements in the Signal Service, which led to an investigation of the matter, and the Committee on Expenditures in the War Department, to whom the subject was referred, submitted the following:

REPORT.

[To accompany House Mis. Doc. 255.]

The Committee on Expenditures in the War Department, under a resolution passed in 1886, beg leave to submit the following report:

Your committee have examined many witnesses and papers, and endeavored to fully investigate the alleged illegal and unauthorized expenditure of certain moneys by the Chief of the Signal Service.

Your committee find that this branch of the War Department was created for the purpose of making observations of storms and the weather, and to prepare and furnish the public with daily forecasts of the same. The law has always been silent as to the manner of conducting the details of the operations in this branch of the service, and the legislation requiring these duties is and has been so meager and embraced in such general terms that many disputes have arisen in construing them.

We find that the Chief Signal Officer, in attempting to secure the object of this law, to-wit, "to furnish an accurate forecast of the weather," it became necessary for this bureau to study the courses and speed of storms, to ascertain the temperature of the atmosphere, and make observations at many points. To do this signal stations were required, men assigned to these tasks, reports required to be made by telegraph to the Chief Signal Officer, and from these data forecasts of the weather made up and sent out over the country for the information of the people. To establish and put in motion this system without any precedent or guide was no small task, and your committee are unanimously of opinion that, whatever construction may have been given to the laws, they were made in good faith, with a view of reaching the end intended by Congress.

While your committee do not concur in the constructions given to many of the statutes, nor does your committee find in the letter of the law authority for all the expenditures made, and while we are of opinion that proper economy has not always been observed, yet we are unable to find any instance where there was a corrupt or fraudulent misapplication of the public moneys, excepting certain items amounting to about $200,000 paid out under the immediate orders of Captain Howgate while he was acting as disbursing officer of the Signal Service. Your committee find the Department of Justice has taken jurisdiction over all these matters, and has instituted civil and criminal proceedings against the guilty parties, and for these reasons your committee decline to take cognizance of any of these matters.

Your committee are of opinion, and to that end recommend, that additional legislation should be enacted more fully defining the duties and prescribing the scope of this branch of the public service, and thus prevent extravagance and erroneous constructions being given to these laws in the future. Especially should there be some legislation more definitely specifying the manner of presenting and verifying the accounts of this branch of the public service.

We herewith accompany this report with the testimony taken by your committee.

(See report No. 2023, H. of R., Forty-ninth Congress, first session; also Mis. Doc. 255, H. of R., Forty-ninth Congress, first session.)

On March 18, 1886, the following letter was sent to the Secretary of War:

SIGNAL OFFICE, WAR DEPARTMENT,
Washington City, March 18, 1886.

SIR: In order that there may be no misunderstanding of the scope of the appropriations which may be made for the support of this service for the fiscal year ending June 30, 1887, nor that anything shall be left to construction, I have the honor to transmit herewith statement showing the items covered by the estimates submitted by this office under the titles "Expenses Signal Service, United States Army," "Observation and report of storms," and "Construction, maintenance, and repair of military telegraph lines," with the request that the same may be forwarded to the honorable the Speaker of the House of Representatives, for use of the Committee on Appropriations.

In regard to the estimates for salaries, stationery, contingent expenses, rents, postage, printing and binding, pay, subsistence, regular supplies, incidental expenses, transportation, barracks and quarters, clothing, camp and garrison equipage, medical department, and ordnance stores, I would say that the language of the estimates and the notes accompanying the same fully explain their scope. I also submit herewith a list of stations covered by the estimates for fuel under the regular supplies.

I am, very respectfully, your obedient servant,

W. B. HAZEN,
Brig. and Bvt. Maj. Gen'l, Chief Signal Officer, U. S. Army.

The SECRETARY OF WAR.

Statement showing the items covered by the estimates submitted by the Signal Office for appropriations for the fiscal year ending June 30, 1887.

Estimates of appropriations required for the service of the fiscal year ending June 30, 1887.

OFFICE OF THE CHIEF SIGNAL OFFICER.

[Signal Service, page 93, Ex. Doc. No. 5, H. R., Forty-ninth Congress, first session.]

Expenses of the Signal Service of the Army, as follows:

Purchase, equipment, and repair of field electric telegraph: This covers the purchase of wire wagons, lance trucks, and battery wagons; wire, lances, battery, and line material and supplies, telegraph instruments and apparatus, crow-bars, digging-bars; repairs to wire wagons, repairs to lance trucks, repairs to battery wagons, tools for repairs, materials for repairs, &c.

Signal equipments and stores: This covers the purchase of cans, canteens and straps, canvas cases and straps, india-rubber cases, compasses (magnetic), funnels, flags (signal), haversacks, lanterns, scissors, flying-flame shades, foot-flame shades, flying extinguishers, foot extinguishers, jointed staffs, straps, flying torches, foot torches, tweezers, wormers, homographic disks, oil, turpentine, wicking, matches, wands, flambeaux, asbestos, packing, brass castings, brass tubing, and for the expenses (such as cages, bracelets, feed, &c.) of maintaining the carrier pigeons belonging to this service and used in experimental field communications, tools for manufacture and repair of equipments, &c.

Binocular (or marine) glasses: This covers the purchase and repair of the marine glasses, purchase of material for repairs, &c.

Telescopes: This covers the purchase and repair of telescopes, purchase of material for repairs, &c.

Heliotropes: This covers the purchase and repair of heliotropes, heliographs, heliotelegraph instruments, including all necessary material for repairs, such as mirrors, pouches, brass, &c.

Other requisite instruments, including absolutely necessary meteorological instruments for use on target ranges: This covers the purchase of telegraph instruments, such as keys, sounders, relays, arresters, &c., and anemometers, wind-vanes, &c.

Telephone apparatus, and maintenance of same at military posts: This covers the purchase or rental of telephones and transmitters; the purchase of call-boxes; the purchase of battery supplies and material; the purchase of material for repairs to telephones, transmitters, and call-boxes, &c.

Tolls over Aqueduct Bridge: This covers the use of the Aqueduct Bridge for the suspension and permanent location thereon of the telegraph wires forming the Signal Service lines between the office of the Chief Signal Officer and the post at Fort Myer, Virginia. Tolls payable to the Alexandria Canal, Railroad and Bridge Company, under an agreement amounting to $500 per annum.

Estimates of appropriations required for the service of the fiscal year ending June 30, 1887, under the War Department, Signal Service.

Observation and report of storms: Expenses of meteorological observations and reports by telegraph, signal or otherwise, announcing the probable approach and force of storms, for the benefit of the commerce and agriculture of the United States (pp. 214–217, Ex. Doc. No. 5, H. R., Forty-ninth Congress, first session).

Manufacture, purchase, and repair of meteorological instruments and expenses (moving, &c.) in connection therewith: This covers the manufacture or purchase of anemometers, anemescopes, barometers, aneroid barometers, blow-pipes, bottles, meteorological-tool boxes, whirling apparatus, porcelain cups, files, forceps, funnels, screw-drivers, scissors, bellows, hygrometer boards, eye-glasses and cases, regulator clocks, alarm-clocks, marine clocks, compasses, hygrometer cups, quicksand cylinders, cord for water thermometers, faucets, gauntlets, rain-gauges, snow-gauges, gimlets, sand-glasses, greasers, artists' leads, mercury, oilers, clock-oil, telescopic anemometer rods, anemometer supports, retorts, self-registers for anemometers, self-registers for anemometers and anemescopes, rain-gauge supports, spatulas, exposed thermometers, maxium thermometers, minimum thermometers, hygrometer thermometers, water thermometers, cases for water thermometers, tin thermometer testers, barometer tubes, test-tubes, photographic apparatus and supplies, &c., all necessary tools and materials for repairs of instruments, labor and material and expenses of erecting and putting instruments in place at stations where they are to be used; expenses of moving and handling instruments, chemicals, ice, &c., for testing instruments, cotton, cloth and boxes for packing and shipping instruments, expenses of experiment and study in connection with instruments, including the expenses of maintaining a physical laboratory, at the office of the Chief Signal Officer.

Telegraphing reports, messages, and other information in connection with the observation and report of storms, &c.: This covers telegrams in cipher at rates fixed by the Chief Signal Officer, as allowed by the Postmaster-General's circulars, sent from any station of this service, taking meteorological observations or received thereat (Washington, D. C., being such a station); special messages relating directly and exclusively to the cipher reports, although themselves not in cipher, sent from any station of this service, taking meteorological observations or received thereat; messages on the administrative affairs of the service—that is, regarding the duties of the enlisted men and civilian employés of the service, on stations where the exigencies of the service requires this mode of communication. In fact, this estimate is intended to cover the expense of any and all charges for telegraphing or telephoning necessary in carrying out efficiently all the appropriations of this service, and including river reports, cautionary displays, cold-wave reports, flood reports, cotton-region reports, hurricane reports, &c., where

such information has to be telegraphed, &c. The accounts to be settled and adjusted by the disbursing officer of the Signal Service.

Maintaining telegraph stations at Jacksonville, and mouth of Saint John's River, Florida: This covers the rent of a telegraph office at Jacksonville, Fla., needed in the relaying of weather reports in that vicinity.

Telephones, and maintenance of same in offices maintained for public use in cities and places receiving reports outside of Washington, D. C., including exchange service in the office of the Chief Signal Officer of the Army: This covers the purchase or rental of telephones or exchange service in the principal cities, where stations of observation are located, as well as similar service in the city of Washington.

Expenses of storm, cautionary, off-shore, cold-wave, railway-train, and other signals on the sea, lake, and Gulf coasts of the United States and the interior, announcing the probable approach and force of storms, including pay of observers, services of operators, lanterns, flags, &c.: This covers the pay of cautionary observers (or displaymen) and operators at the following or such other stations as may be deemed necessary by the Secretary of War: Ahnapee, Wis.; Ashtabula, Ohio; Bass River Light, Mass.; Bath, Me.; Bay City, Mich.; Booth Bay, Me.; Bristol, R. I.; Brunswick, Ga.; Cape Vincent, N. Y.; Charlevoix, Mich.; Charlotte, N. Y.; Cheboygan, Mich.; Monroe, Fort, Va.; Montague, Mich.; Morgan, Fort, Ala.; Muskegon, Mich.; New Bedford, Mass.; Newburyport, Mass.; New Haven Light, Conn.; Newport, R. I.; North Fair Haven, N. Y.; Northport, Mich.; Petoskey, Mich.; Pentwater, Mich.; City Island, N. Y.; Corpus Christi, Tex.; Dunkirk, N. Y.; East Tawas, Mich.; Elk Rapids, Mich.; Fall River, Mass.; Fernandina, Fla.; Fort George Island, Fla.; Frankfort, Mich.; Gloucester, Mass.; Green Bay, Wis.; Highland Light, Mass.; Hyannis, Mass.; Kenosha, Wis.; Kewaunee, Wis.; Ludington, Mich.; Manistee, Mich.; Manitowoc, Wis.; Marblehead, Mass.; Menominee, Mich.; Point Judith, R. I.; Port Eads, La.; Port Royal, S. C.; Portsmouth, N. H.; Provincetown, Mass.; Racine, Wis.; Rockland, Me.; Saint Augustine, Fla.; Saint Joseph, Mich.; Sand Beach, Mich.; Sand Key Light, Florida; Sheboygan, Wis.; Southeast Light, R. I. (Block Island); South Haven, Mich.; Southwest Harbor, Me.; Stonington, Conn.; Sturgeon Bay, Wis.; Traverse City, Mich.; Tybee Island, Ga.; Wood's Holl, Mass.; station on Martha's Vineyard Island; station on Nantucket Island. The purchase of international code signal books, Piddington's horn books, maritime registers, nautical gazettes, cautionary-signal boards, oil, oil-cans, Coston lights, cautionary flags, off-shore flags, direction flags, railway and train flags, cold-wave flags, weather and temperature flags, on-shore flags, international flags, tin flag-symbols, halliards, cautionary signal indicators, lanterns, signal-lamps, flag-staffs, wicks, matches. Also for repairs to flag, lanterns, &c.; the expenses of erecting flag-staffs, washing and repairing flags, tools for repairs, &c.

Continuing the connection of signal stations with life-saving stations and light-houses (such connections being considered necessary as per opinions expressed by the Superintendent of the Life-Saving Service and the Chairman of the Light-House Board), including services of operators, repairmen, materials (such as cable, wire, poles, insulators, &c.), and general service, being for the maintenance and repair of the military telegraph line along the Atlantic coast of the United States. This covers the services of operators, repairmen, and other general service at the following or such other stations as may be deemed necessary by the Secretary of War: Atlantic City, N. J.; Barnegat City, N. J.; Block Island, R. I.; Cape Henry, Va.; Chincoteague, Va.; Hatteras, N. C.; Kitty Hawk, N. C.; Little Egg Harbor, N. J.; Cape Henlopen, Del.; Cape May Point, N. J.; Wash Woods, N. C.; Macon, Fort, N. C.; station on Martha's Vineyard Island; station on Nantucket Island; Narragansett Pier, R. I.; New River Inlet, N. C.; Norfolk, Va.; Ocean City, Md.; Point Judith, R. I.; Smithville, N. C.; Wilmington, N. C. The purchase of cable, wire, poles, insulators, brackets, plugs, cross-arms, nails, telegraph instruments, saddle-bags, boats, bridles, boat-chains, stable-forks and utensils, flags, (special life-saving), halters, harness, carts (repair), wreck-knapsacks, rent or purchase of telephones, transmitters, and call-boxes, spikes, pikes, wire reels, riding-saddles, pack-saddles, spurs, skiffs, oars, boatsails, surcingles, soldering tools, vises, subscription to maritime registers and nautical gazettes, and, in cases of emergency, the payment for the transportation of materials from points to points on the sea-coast line where the delay in securing transportation through the Quartermaster's Department would be disastrous to the service, and where it will be impossible to secure other transportation than that furnished by the natives by rowboat, team, or buck-board; the hire of teams, boats, animals, and other means of conveyance and help necessary in repairing the sea-coast line; the stabling of animals used for the same purposes; the ferriage of repair parties in crossing inlets, and other costs of short transits to repair the line.

Manufacture, purchase, and repair of instrument-shelters, and expenses in connection therewith: This covers instrument-shelters, instrument-shelter supports, labor,

lumber, and nails, &c. For making same. expenses of erecting shelters and supports, and repairs to shelters and supports, including re-painting, removing, &c.

Rents of offices, hire of civilian employés, furniture and other office supplies, light, heat (except coal and wood), heating-supplies, stationery, ice, repairs, rents of telephones, and for such other absolutely necessary expenses, not otherwise provided for, of offices maintained as stations of observation in cities or places outside of Washington, D. C. This covers all expenses of maintaining the following or such other stations as may be deemed necessary by the Secretary of War: Boston, Mass.; Chicago, Ill.; Cincinnati, Ohio; New York City, N. Y.; Abilene, Tex.; Albany, N. Y.; Alpena, Mich.; Atlanta, Ga.; Atlantic City, N. J.; Augusta, Ga.; Baltimore, Md.; Barnegat City, N. J.; Block Island, R. I.; Buffalo, N. Y.; Cairo, Ill.; Cape Henry, Va.; Cape Mendocino, Cal.; Cedar Keys, Fla.; Charleston, S. C.; Charlotte, N. C.; Chattanooga, Tenn.; Cheyenne, Wyo.; Chincoteague, Va.; Kitty Hawk, N. C.; Knoxville, Tenn.; La Crosse, Wis.; Lamar, Mo.; Leavenworth, Kans.; Little Rock, Ark.; Los Angeles, Cal.; Louisville, Ky.; Lynchburg, Va.; Philadelphia, Pa.; Saint Louis, Mo.; San Francisco, Cal.; Cleveland, Ohio; Columbus, Ohio; Concordia, Kans.; Davenport, Iowa; Denver, Colo.; Des Moines, Iowa; Detroit, Mich.; Eastport, Me.; El Paso, Tex.; Erie, Pa.; Escanaba, Mich.; Fort Smith, Ark.; Galveston, Tex.; Grand Haven, Mich.; Hatteras, N. C.; Huron, Dak.; Indianapolis, Ind.; Indianola, Tex.; Jacksonville, Fla.; Keokuk, Iowa; Key West, Fla.; Pittsburg, Pa.; Port Huron, Mich.; Portland, Me.; Portland, Oreg.; Red Bluff, Cal.; Rochester, N. Y.; Roseburg, Oreg.; Sacramento, Cal.; Mackinaw City, Mich.; Macon, Fort, N. C.; Marquette, Mich.; Memphis, Tenn.; Milwaukee, Wis.; Mobile, Ala.; Montgomery, Ala.; Moorhead, Minn.; Mount Washington, N. H.; Nashville, Tenn.; New London, Conn.; New Orleans, La.; Norfolk, Va.; North Platte, Nebr.; Olympia, Wash.; Omaha, Nebr.; Oswego, N. Y.; Palestine, Tex.; Pensacola, Fla.; Dubuque, Iowa; Boise City, Idaho; Frisco, Utah; Greencastle, Ind.; Keeler, Cal,; Deadwood, Dak.; Montrose, Colo.; Sitka, Alaska; Little Egg Harbor, N. J.; New River Inlet, N. C.: Wash Woods, N. C.; station on Nantucket Island; Saint Paul, Minn.; Saint Vincent, Minn.; Salt Lake City, Utah; San Diego, Cal.; Sandusky, Ohio; Sandy Hook, N. J.; San Luis Obispo, Cal.; Santa Fé, N. Mex.; Savannah, Ga.; Shreveport, La.; Smithville, N. C.; Springfield, Ill.; Toledo, Ohio; Valentine, Nebr.; Vicksburg, Miss.; West Las Animas, Colo.; Winnemucca, Nev.; Yankton, Dak.; Yuma, Ariz.; Colorado Springs, Colo.; Pike's Peak, Colo.; Sanford, Fla.; Wilmington, N. C.; New Haven, Conn.; Duluth, Minn.; San Antonio, Tex.; Cape Henlopen, Del.; Narragansett Pier, R. I.; Ocean City, Md.; station on Martha's Vineyard Island. To particularize the expenses, they are as follows: Rent of offices, where no accommodations are furnished in public buildings; the hire of civilian observers, assistant observers, messengers, janitors, and cleaners; the purchase of basins, bedsteads, blankets, brooms, brushes, buckets, bed-sacks, carpets, bookcases, office cases, pigeon-hole cases, chairs, water coolers, cups, table covers, cushions, desks, dippers, dusters, file cases, linoleum, lounges, mats or rugs, matting, mattresses, mirrors, maps, oil-cloth, dust-pans, pillows, pitchers, pots, book-racks, coat-racks, towel-racks, shades or curtains, office signs, spittoons, stands or tables, stools, towels, tubs, washstands, snow-shoes, moccasins, &c.; payment for gas, purchase of lamps, lanterns, oil, oil-cans, wicks, matches, lamp chimneys; repairs to lamps and lanterns; the purchase of stoves, pokers, coal-scuttles, fire-shovels, zincs for stoves, &c., repairs to stoves, &c.; payment for heating offices by steam, gas, or hot air; purchase of writing paper, envelopes, ink, mucilage, pens, pencils, blank-books, and other items of stationery; the purchase of ice, washing of towels, expenses in moving office, drinking water (when it cannot be obtained except by purchase); reimbursement to enlisted men for expenses incurred in making short transits in cities, in carrying out special instructions from this office, in connection with the meteorological service; repairs to offices where such repairs are necessary to fit the offices for the needs of this service, and repairs to buildings owned by this service; lumber, nails, and other material, and expenses for making packing boxes for shipment of supplies to stations of observation outside of Washington, D. C.; subscription to the American. Meteorological Journal for issue to stations for use of observers; for necessary expenses in fitting up and maintaining stations of observations that may be established or re-established during the year, and for such other absolutely necessary expenses not specifically set forth, but necessary in the maintenance of the stations.

Expenses incident to the copying of synchronous international meteorological observations, to be used in connection with the publications of this office, and for observations in the West Indies, for special use in the announcement of hurricanes on the Atlantic and Gulf coasts of the United States. This covers the salaries of civilian observers in the West Indies at the following or such other stations as the Secretary of War may consider necessary: Havana, Cuba; Kingston, Jamaica; St. Thomas, St. Thomas; San Juan, Porto Rico; Santiago de Cuba, Cuba; Pointe a Pitre, Guadeloupe; Bridgetown, Barbadoes; St. Pierre, Martinique. The payment is for taking tri-daily meteoro-

logical observations, for telegraphing them, for forwarding mail reports, and for telegraphing hurricane information; payment for services rendered in collecting and copying reports of meteorological observations made on board of vessels of foreign nations for use in the publications of the international bulletin.

River and flood observations and expenses incidental thereto: This covers the pay of the river observers at the following or such other stations as the Secretary of War may deem necessary: Albany, Oreg.; Alexandria, La.; Arkansas City, Ark.; Boonville, Mo.; Brookville, Pa.; Brunswick, Mo.; Brownsville, Pa.; Burnside, Ky.; Beardstown, Ill.; Bayou Sara, La.; Colusa, Cal.; Confluence, Pa.; Clarion, Pa.; Charleston, Tenn.; Clinton, Tenn.; Carthage, Tenn.; Coushatta Chute, La.; Camden, Ark.; Decatur, Ala.; Delhi, La.; Eugene City, Oreg.; Evansville, Ind.; Folsom City, Cal.; Freeport, Pa.; Fulton, Ark.; Harper's Ferry, W. Va. (during floods); Helena, Ark.; Hermann, Mo.; Gerard, La.; number reports, doubtful; Grand Tower, Ill.; Johnsonville, Tenn.; Johnstown, Pa.; Jerome, Mo.; Kansas City, Mo.; Kingston, Tenn.; Le Claire, Iowa; Loudon, Tenn.; Leadvale, Tenn.; Louisiana, Mo.; Lock No. 4, Pa.; Mahoning, Pa.; Marietta, Ohio; Marysville, Cal.; Monroe, La.; Mount Carmel, Ill.; Morgantown, W. Va.; Mount Holly, N. C.; New Geneva, Pa.; Newport, Ark.; Oil City, Pa.; Oroville, Cal.; Paducah, Ky.; Peoria, Ill.; Plattsmouth, Nebr.; Parker's Landing, Pa.; Rowlesburg, W. Va.; Rockwood, Tenn.; Saint Joseph, Mo.; Saltsburg, Pa.; Strawberry Plains, Tenn.; Umatilla, Oreg.; Vincennes, Ind. (special observations); Warsaw, Ill.; Wheeling, W. Va.; Warren, Pa.; Weston, W. Va.; Wabasha, Minn.; West Melville, La.; Yazoo City, Miss. The employment of a civilian clerk outside of Washington, D. C., having charge, under orders from this office, of the erection and repair of river gauges and instructing the observers (in regard to their duties) at the various river stations of the service. The manufacture, purchase, construction, erection, and repair of river gauges, and the manufacture, purchase, and repair of rain gauges, and the wind-vanes used in the special work, including all labor, tools, and materials for the same, and for such other proper expenses necessary to maintain this branch of the service.

Expenses (including paper, forms, printing supplies, hire of civilian printers, engravers, &c.) of preparing, printing, and distributing maps and bulletins to be displayed in chambers of commerce and boards of trade rooms and for distribution; also for "professional papers," "Signal Service notes," and for the maintenance of a printing office under the direction of the Chief Signal Officer, in the city of Washington, for the printing of the necessary orders, circulars, maps, bulletins, &c., as may be necessary to carry into effect the appropriations made for the support of the Signal Service: This covers paper for printing at the office of the Chief Signal Officer, and for such other printing stations as the Secretary of War may deem necessary; the purchase of press-blankets, bellows, bed-plates, benzine, bodkins, miter boxes, oil cans, printing cases, type cases, chases, paper-cutter, presses, cyclostyles and appurtenances, printing-press covers, dies, matrices, type symbols, electrotypes, stereotypes, bulletin frames, map frames, monthly mean frames, printing frames, type furniture, galleys, hektographs and supplies for same; printing ink, leads, lye, mallets, paint mills, boilers, engines, oil, planers, printing presses, punches, quoins, damping rollers, ink-rollers, proof presses, rule, composing rules, imposing stand, type-stands, printing sticks, shooting sticks, styli, spatulas, tin (sheets of), tweezers, twine, type, turpentine, tallow, lithograph presses, lithograph stone, lithograph ink, and such other supplies and material necessary; the hire of civilian printers at such stations where in the opinion of the Secretary of War their services may be necessary; the purchase of large wall maps and symbols for display, the purchase of manifold forms, carbon paper, and expenses of preparing and issuing the forms, the services of engravers and the engraving of maps, charts, &c.; the distribution of publications through the Smithsonian Institution; wrappers for bulletins; the preparing, printing, and publishing of "professional papers," "Signal Service notes," weather reviews, &c., and for the maintenance of a printing office under the direction of the Secretary of War, in the city of Washington, for the printing of the necessary orders, circulars, schedules, forms, maps, bulletins, &c., as may be necessary to carry into effect the appropriations for the support of the Signal Service.

Observations and expenses incidental thereto announcing the probable approach and severity of frosts for the benefit of the cotton region of the United States: This covers: the pay of observers, operators, and messengers in taking, sending, receiving, relaying, &c., cotton region reports at the following or such other stations as the Secretary of War may deem necessary: Aberdeen, Miss.; Albany, Ga.; Alexandria, La.; Allapaha, Ga.; Allendale, S. C.; Amite City, La.; Anderson, S. C.; Arkansas City, Ark.; Athens, Ga.; Austin, Tex.; Brenham, Tex.; Bainbridge, Ga.; Batesburg, S. C.; Batesville, Miss.; Beaumont, Tex.; Belton, Tex.; Birmingham, Ala.; Blackville, S. C.; Bolivar, Tenn.; Branchville, S. C.; Calera, Ala.; Cammack, Ga.; Cartersville, Ga.; Cheneyville, La.; Cheraw, S. C.; Chester, S. C.; Columbia, S. C.; Columbia, Tex.; Brinkley, Ark.; Brookhaven, Miss.; Brownsville, Tenn.; Columbus, Ga.; Columbus, Miss.; Corinth, Miss.;

Corsicana, Tex.; Coushatta Chute, La.; Covington, Tenn.; Cuero, Tex.; Dallas, Tex.; Dalton, Tex.; Decatur, Ala.; Devall's Bluff, Ark.; Dyersburg, Tenn.; Eastman, Ga.; Edwards, Miss.; Eufaula, Ala.; Evergreen, Ala.; Fernandina, Fla.; Florence, S. C.; Fort Deposit, Ala.; Fort Gaines, Ga.; Gainesville, Ga.; Goldsborough, N. C.; Grand Junction, Tenn.; Greenville, S. C.; Greenville, Ala.; Greenwood, S. C.; Grenada, Miss.; Griffin, Ga.; Hardeeville, S. C.; Hazlehurst, Miss.; Hearne, Tex.; Helena, Ark.; Hempstead, Tex.; Hernando, Miss.; Holly Springs, Miss.; Houston, Tex.; Huntsville, Tex.; Jackson, Miss.; Jacksonborough, S. C.; Jessup, Ga.; Kensett, Ark.; Kingstree, S. C.; La Fayette, La.; Lake, Miss.; Live Oak, Fla.; Livingston, Ala.; Longview, Tex.; Luling, Tex.; Lumberton, N. C.; Macon, Ga.; Macon, Miss.; Madison., Ark.; Magnolia, Ark.; Malvern, Ark.; Marion, Ala.; Meridian, Miss.; Milan, Tenn.; Millen, Ga.; Minden, La.; Monroe, La.; Monticello, Ark.; Natchez, Miss.; Natchitoches, La.; New Berne, N. C.; Newport, Ark.; Okolona, Miss.; Opelika, Ala.; Opelousas, La.; Orange, Tex.; Oxford, Miss.; Paris, Tex.; Paris, Tenn.; Pine Apple, Ala.; Pine Bluff, Ark.; Fort Gibson, Miss.; Prescott, Ark.; Quitman, Ga.; Raleigh, N. C.; Russellville, Ark.; Saint George's, S. C.; Saint Matthew's, S. C.; Salisbury, N. C.; Scottsborough, Ala.; Selma, Ala.; Smithville, Ga.; Sour Lake, Tex.; Spartanburg, S. C.; Texarkana, Ark.; Thomasville, Ga.; Toccoa, Ga.; Tuscumbia, Ala.; Tyler, Tex.; Union Point, Ga.; Waco, Tex.; Waldo, Fla.; Wadesborough, N. C.; Washington, Ga.; Way Cross, Ga.; Withe, Tenn.; Waynesborough, Ga.; Waynesborough, Miss.; Weatherford, Tex.; Weimar, Tex.; Weldon, N. C.; West Point, Ga.; Whiteville, La.; Yemassee, S. C. The purchase of thermometers and rain-gauges and repairs to the same; the purchase of instrument shelters and repairs to the same, and for such other incidental expenses as may be necessary.

Expenses of collection and collation of meteorological observations made by ship-masters and ship captains, for the more complete study of storms, with a view to the accurate prediction of their frequency, periodicity, and direction: This covers subscription to Maritime Registers and Nautical Gazettes for issue to ship captains in return for observations furnished, and other expenses of marine agencies at New York, Boston, Philadelphia, Baltimore, and San Francisco, or at such other places as in the opinion of the Secretary of War such agencies may be necessary.

Expenses incident to the instruction department at the post of Fort Myer, Va., including text-books, stationery, furniture, &c.: This covers stationery, telegraph instruments, and supplies, text-books, furniture, and such other articles or expenses necessary to maintain and continue the work of this department of the Bureau.

For incidental expenses not otherwise provided for: This covers such items of legitimate expenses which cannot now be anticipated and thus specifically provided for.

Library and other books, periodicals, and newspapers: This covers necessary books of reference in prosecuting the study of the science of meteorology, as well as text-books for issue to stations of observation, such as Buchan's Hand-Book of Meteorology, Culley's Telegraphy, Guyot's Meteorological Tables, Loomis's Meteorology, Pope's Telegraphy, Prescott's Electricity, &c. Also, subscription to scientific periodicals and newspapers.

Manuscript and card catalogues: This covers the purchase of original manuscripts on meteorological subjects from the authors of the same, as well as expenses in preparing card catalogues of meteorological bibliography.

Lumber: This covers lumber of all grades and kinds for the purpose of making packing-boxes for shipment of material and supplies to stations outside of Washington, D. C.

Advertising: This covers the cost of advertising notices inviting proposals for furnishing supplies, &c., and for sales of condemned property.

Erection of a new observatory on Mount Washington, N. H.: This is to provide for the better protection of the men and material at the station of Mount Washington, N. H., a very important station of this service, yet in winter isolated from the world, and in order to obtain the best results for the Signal Bureau.

Estimates of appropriation required for the service of the fiscal year ending June 30, 1887, under the War Department, Signal Service.

Construction, maintenance, and repair of military telegraph lines. (P. 217, Ex. Doc. No. 5, Forty-ninth Congress, first session.)

Construction of military telegraph line for the connection of military posts as follows: Fort Gaston, Cal., to North Fork Mad River, Cal., 30 miles; Fort Halleck, Nev., to Halleck Station, Nev., 12 miles, including instruments, materials, and extra-duty pay to troops. This covers the purchase of wire, poles, insulators, brackets, telegraph instruments, battery material, and supplies, &c., and the extra-duty pay to be paid to

the enlisted men detailed to build the lines, and the hire of teams, wagons, tools, &c., in connection with the building of said lines.

Maintenance and repair of military telegraph lines, including rents of offices, salaries of civilian operators and repairmen, lights, supplies, and general repairs: This covers the expenses of maintaining the following or such other stations as may be deemed necessary by the Secretary of War: Astoria, Oreg.; Ashland, Oreg.; Apache, Fort, Ariz.; Assinaboine, Fort, Mont.; Ash Fork, Ariz.; Bismarck, Dak.; Bridger, Fort, Wyo.; Brownsville, Tex.; Buford, Fort, Dak.; Benton, Fort, Mont.; Bidwell, Fort, Cal.; Bennett, Fort, Dak.; Bowie, Fort, Ariz.; Canby, Fort, Wash.; Custer, Fort, Mont.; Cantonment, Ind. T.; Carter, Wyo.; Custer Station, Mont.; Coeur d'Alene, Idaho; Dodge City, Kans.; Dayton, Wash.; Davis, Fort, Tex.; Durango, Colo.; Elliott, Fort, Tex.; Edinburg, Tex.; Glendive, Mont.; Galpin, Mont.; Grant, Fort, Mont.; Helena Mont.; Henrietta, Tex.; Klamath, Fort, Oreg.; Lewiston, Idaho; Lakeview, Oreg.; Laramie, Fort, Wyo.; Linkville, Oreg.; Lava, N. Mex.; Lacota, Dak.; Larimore, Dak.; Maginnis, Fort, Mont.; Maricopa, Ariz.; McDowell, Fort, Ariz.; Marfa, Tex.; Neah Bay, Wash.; Pysht, Wash.; Poplar River, Mont.; Port Angeles, Wash.; Phœnix, Ariz.; Parker's, Oreg.; Rio Grande City, Tex.; Reno, Fort, Ind. T.; Robinson, Fort, Nebr.; Shaw, Fort, Mont.; Spokane Falls, Wash.; Stanton, Fort, N. Mex.; Stockton, Fort, Tex.; San Carlos Agency, Ariz.; Spokane, Fort, Wash.; Supply, Fort, Ind. T.; Santa Maria, Tex.; Sully, Fort, Dak.; Sill, Fort, Ind. T.; Tatoosh Island, Wash.; Totten, Fort, Dak.; Thomas, Fort, Ariz.; Tucson, Ariz.; Verde, Fort, Ariz.; Watrous, N. Mex.; Webster, Dak.; Wickenburg, Ariz.; Willcox, Ariz.; Yates, Fort, Dak. These expenses are for rents of offices, the hire of civilian operators, repairmen, and messengers; the purchase of lamps, lanterns, matches, oil, wicks, lamp-chimneys; the payment for gas; purchase of lightning arresters, axes, crowbars, digging bars, switch-boards, iron boots, battery-boxes, call-boxes, cable-boxes, brackets, cable, battery cells, clamps, climbers and straps, battery connectors, coppers, sulphate of copper, plug-drivers, soldering furnaces, electric gongs, telegraph keys, sounders, relays, pocket relays, box sounders, repeaters, insulators, nails, picks, ground plates, pliers, poles, plugs, pulleys, reels, switches, screw-drivers, shovels, syringes, solder, spikes, telephones, wire, zincs, tariff-books, repairs to cables; hire of teams, boats, animals, and other means of conveyance, and help on repair trips, ferriage, tolls, and other costs of short transits to repair the lines; purchase of office furniture and supplies, rent of post-office boxes, storage of telegraph material, purchase of stoves and heating supplies (except fuel), and for such other expenses as may be considered necessary to maintain the lines and keep them in proper working order.

The other estimates made by this service for pay, subsistence, regular supplies, incidental expenses, transportation, barracks and quarters, clothing, camp and garrison equipage, medical department, ordnance stores, are fully explained in the language of the estimates and notes accompanying the same.

Under the title "Signal Service, regular supplies, fuel, authorized allowance for enlisted men at Fort Myer, Va., and for various offices at Fort Myer, Va., and on United States military-telegraph lines, and at stations of observation outside of Washington, D. C., and for sales of the regulation allowance to officers of the Signal Corps, and those doing duty therewith (for fires the year round when needed):" It is intended that this estimate shall provide fuel for the following-named stations or such others as the Secretary of War may deem necessary: Atlantic City, N. J.; Alpena, Mich.; Abilene, Tex.; Augusta, Ga.; Baltimore, Md.; Boisé City, Idaho; Block Island, R. I.; Chattanooga, Tenn.; Cape Henry, Va.; Cape Henlopen, Del.; Cape Mendocino, Cal.; Charleston, S. C.; Charlotte, N. C.; Cedar Keys, Fla.; Chicago, Ill.; Chincoteague, Va.; Concordia, Kans.; Colorado Springs, Colo.; Deadwood, Dak.; Des Moines, Iowa; Dubuque, Iowa; Eastport, Maine; Escanaba, Mich.; El Paso, Tex.; Erie, Pa.; Frisco, Utah; Fort Smith, Ark.; Galveston, Tex.; Greencastle, Ind.; Hatteras, N. C.; Huron, Dak.; Indianola, Tex.; Jacksonville, Fla.; Keeler, Cal.; Keokuk, Iowa; Key West, Fla.; Kitty Hawk, N. C.; Lamar, Mo.; La Crosse, Wis.; Leavenworth, Kans.; Little Rock, Ark.; Logansport, Ind.; Los Angeles, Cal.; Lynchburg, Va.; Marquette, Mich.; Mackinaw City, Mich.; Macon, Fort, N. C.; Memphis, Tenn.; Milwaukee, Wis.; Mobile, Ala.; Montgomery, Ala.; Moorhead, Minn.; Montrose, Colo.; Mount Washington, N. H.; Narragansett Pier, R. I.; Nashville, Tenn.; New London, Conn.; New River Inlet, N. C.; Norfolk, Va.; Ocean City, Md.; Omaha, Nebr.; Oswego, N. Y.; Olympia, Wash.; Pensacola, Fla.; Pike's Peak, Colo.; Portland, Oreg.; Port Huron, Mich.; Red Bluff, Cal.; Roseburg, Oreg.; Savannah, Ga.; Salt Lake City, Utah; Sacramento, Cal.; San Francisco and branch, Cal.; Santa Fé, N. Mex.; Saint Paul, Minn.; Saint Vincent, Minn.; San Diego, Cal.; San Luis Obispo, Cal.; Sanford, Fla.; Sandy Hook, N. J.; Shreveport, La.; Sitka, Alaska; Smithville, N. C.; Valentine, Nebr.; Vicksburg, Miss.; Walla Walla, Wash.; Wash Woods, N. C.; West Las Animas, Colo.; Wilmington, N. C.; Winnemucca, Nev.; Yankton, Dak.; Yuma, Ariz.

Telegraph Offices—Apache, Fort, Ariz.; Assinaboine, Mont.; Ashland, Oreg.; Astoria, Oreg.; Bismarck, Dak.; Brownsville, Tex.; Bridger, Fort, Wyo.; Buford, Fort, Dak.; Bidwell, Fort, Cal.; Cantonment, Ind. T.; Cœur d'Alene, Fort, Idaho; Custer, Fort, Mont.; Canby, Fort, Wash.; Dodge City, Kans.; Davis, Fort, Tex.; Elliott, Fort, Tex.; Helena, Mont.; Klamath, Fort, Oreg.; Lakeview, Oreg.; Lava, N. Mex.; Lewiston, Idaho; Linkville, Oreg.; Maricopa, Ariz.; Maginnis, Fort, Mont.; McDowell, Fort, Mont.; Myer, Fort, Va.; Neah Bay, Wash.; Prescott, Ariz.; Phœnix, Ariz.; Port Angeles, Wash.; Poplar River, Mont.; Pysht, Wash.; Reno, Fort, Ind. T.; Rio Grande City, Tex.; Robinson, Fort, Neb.; San Carlos, Ariz.; Stanton, Fort, N. Mex.; Sully, Fort, Dak.; Sill, Fort, Ind. T.; Spokane Falls, Wash.; Stockton, Fort, Tex.; San Antonio, Tex.; Tatoosh Island, Wash.; Thomas, Fort, Ariz.; Totten, Fort, Ariz.; Wickenburg, Ariz.; Willcox, Ariz.; Yates, Fort, Dak.

(See Ex. Doc. No. 175, H. of R., Forty-ninth Congress, first session.)

PROPERTY RESPONSIBILITY.

In regard to my responsibility for the property belonging to this service, I would say that under the present rules each article purchased is taken up on the property report which is rendered quarterly to the Chief Signal Officer, for transmission to the Third Auditor of the Treasury, so that not one article, from the merest trifle to the most expensive, but what is carefully reported every three months to the accounting officers of the Treasury. And when it is considered that the property is scattered all over the United States at all of the stations of this service, and that frequent inventories have demonstrated the absolute accuracy of my reports, the vast amount of care required to produce such a result can be more readily appreciated.

Whenever articles for the use of the Government are ordered and received at this office I have in each case personally examined the same, so far as their receipt at this office was concerned, and have had the articles inspected by a competent person before their acceptance.

STORE-HOUSE.

There is always an accumulation at this office of valuable Government property, and I would invite the attention of the Chief Signal Officer to the very inadequate store-house, and recommend that, if possible, some action may be taken to furnish storage room of a better character and greater capacity.

FIRE-PROOF BUILDING.

It would seem that while several estimates have been submitted for a fire-proof building, they have been thus far ignored, and the accumulation of the work of this service and the result of the observations made, together with the valuable property, is worth protection. Congress should be urged to favorably consider the estimate submitted for a fire-proof building adapted to the needs of this service.

STATUS OF WORK.

The work of the division is well up to date, and all possible provision has been made to continue the service for the next fiscal year on the same basis as during the past fiscal year. Leases have been renewed (subject, of course, to an appropriation) and proposals have been invited and received for the year's supplies at this office, as well as at stations, as needed. Of course no authorities can issue looking to incurring any expense until Congress shall have passed the appropriations for which estimates have been submitted.

I would invite attention to the fact that when I entered upon the duties of property and disbursing officer, one year ago, I was not at all familiar with the duties of that office, but had to rely in a great measure upon the knowledge of the chief clerk of the division, Mr. W. R. Bushby, and I take great pleasure in stating that the efficient service rendered by him has been of inestimable assistance to me in transacting the business of the division.

I would also state that with but few exceptions the men on duty in the division have well and faithfully performed the duties assigned them.

I am, very respectfully, your obedient servant,

FRANCIS B. JONES,
Captain and Assistant Quartermaster, U. S. A.,
Property and Disbursing Officer, Signal Service.

The CHIEF SIGNAL OFFICER OF THE ARMY.

APPENDIX 15.

ANNUAL REPORT OF THE EXAMINING OFFICER.

SIR: The work of this division has been conducted with the same regularity and form as in the preceding years. No new rules or methods have been introduced. The duties now as in the past relate wholly to the preservation of the fiscal integrity of the service. So far as lies within my power, no purchases or engagements are made that are not necessary, economical, and lawful, and no disbursements are made that come under my supervision that are not in strict accordance with previous authority or approval.

As is but natural, cases occasionally arise where authority for expenditure of money is requested in which the request does not coincide with my views upon the subject. These cases are fully investigated and a satisfactory understanding is arrived at before the issuance of the authority, or else, failing such understanding, the matter is referred for the personal decision of the Chief Signal Officer. Such cases are fortunately rare.

This division, originally instituted for the purpose of assuring a rigid honesty in the monetary affairs of the service, after an *exposé* of unparalleled thievery and looseness of management, itself in a great measure culpable, has, happily, because of the sometimes painfully solicitous honest management of the application and disbursement of the public funds, reached a time when the corrections to be made and errors to be guarded against are those that are purely technical in their nature.

Were we sure that in the future there would be the same rigid honesty on the part of all officers whose duties lie near to the appropriations for the support of this service, this division might well be abolished and the purely clerical labor of examining property returns of signal property throughout the country confided to a branch of the property division. But the millennium has not yet arrived; indeed, is hardly due, judging from recent matters connected with this service, and none are infallible but ourselves.

It seems to me at times that, for the small amounts of signal property in the hands of very many officers, the amount of reports and the labor of examination are greatly in excess of the value of the articles reported.

When it is considered that these reports require the preparation, examination here, the notification of the responsible officer, frequent but necessary correction of insignificant errors, the transmittal with a separate letter for each account to the Third Auditor and their examination there, and that this happens four times in each year, and that these reports must necessarily cover only property small in quantity and value, it is worthy of serious thought whether or not a report of signal property made once in each year, or at most once in each half year, would not be all-sufficient.

I must call attention to the deplorable sanitary condition of the rooms occupied by this division; the working room in which three clerks are daily confined is small and dark, cold in winter and warm in summer. Such quarters surely shorten their lives. My own room is little better, and to add to the situation there is an ever-present stale, ill-smelling odor, rising at frequent times to a pitch that is all but visible. I am aware that these are the best rooms the service can afford, and that they are much better than many others.

The office force, with myself, have worked steadily, faithfully, and diligently, and in these days of threatened disaster and insidious attack can but look forward into the future, wondering and fearing.

A summarized report of the work performed in the division has been already submitted, and should be filed with this report as a part thereof.

I am, very respectfully, your obedient servant,

FRANK GREENE,
Second Lieutenant, Signal Corps, U. S. Army,
In charge of the Examiner's Division.

The CHIEF SIGNAL OFFICER OF THE ARMY.

Summary of work performed in Examiner's Division, Office of the Chief Signal Officer, during the fiscal year ending June 30, 1886.

[Name of officer in charge—Second Lieut. Frank Greene, Signal Corps, U. S. Army.]

Date.	Returns of Signal equipments and stores examined and forwarded to the U. S. Treasury.	Letters sent in connection with the examination of money accounts and property returns.	Letters received and recorded.	Letters of authority for purchases and expenditures received, examined, and recorded.	Purchase vouchers audited and recorded.	Expenditure vouchers audited and recorded.	Accounts current, line receipts, examined and forwarded to the U. S. Treasury.	Weekly and monthly statements of public funds recorded and verified.	Accounts current of the Pro-	Accounts current, sales at auction, audited and forwarded to U. S. Treasury.
July, 1885	61	301	438	419	106	472	5	10	0	0
Aug., 1885	88	654	114	306	97	548	0	12	8	0
Sept., 1885	45	121	106	247	149	682	6	8	0	0
Oct., 1885	19	54	240	287	130	794	0	6	0	0
Nov., 1885	82	225	136	197	96	347	10	15	0	2
Dec., 1885	82	322	119	264	144	394	9	18	2	0
Jan., 1886	109	250	255	291	124	570	3	13	1	0
Feb., 1886	77	205	90	105	66	335	3	9	0	0
Mar., 1886	110	260	112	158	200	449	0	16	2	0
April, 1886	88	209	246	179	80	428	5	9	2	0
May, 1886	129	307	110	199	122	456	10	18	3	0
June, 1886	31	81	109	205	156	417	4	16	0	0
	*916	2,799	2,080	2,857	1,477	[illegible]	*55	[illegible]	*13	2

*These figures do not, however, represent the actual number of papers handled, as in nearly every instance the accounts and returns are accompanied by numbers of vouchers and subvouchers, varying from one or two to several hundred, as in the accounts of the Property and Disbursing Officer, which have varied from 600 to 800 each, which do not appear as a separate item in this summary.

APPENDIX 16.

ANNUAL REPORT OF THE OFFICER IN CHARGE OF THE PUBLICATIONS DIVISION.

PUBLICATIONS DIVISION, SIGNAL OFFICE,
Washington, D. C., July 1, 1886.

SIR: I have the honor to herewith submit the report of work done in the Publications Division during the fiscal year ending June 30, 1886:

The total number of employés in the division is 30, consisting of 22 enlisted men and 8 civilians, a reduction of 14 since my last report. This reduction of force was incident to the discontinuance of the publication of the Daily Bulletin of International Observations and of Professional Papers and Signal Service Notes, and was further necessitated by deficiency of appropriation. These employés are classified as follows: Chief clerk, 1; clerks, 3; draughtsmen, 5; printers, 8; lithographers, 4; proof-reader, 1; pressmen, 3; press boy, 1; stitchers and folders, 2; engineer, 1; laborer, 1.

The division is divided into three subdivisions, known as the draughting room, printing room, and distributing room, each with a capable man in charge. The reports foi the several subdivisions are given below:

DRAUGHTING ROOM.

The force in this subdivision consists of one sergeant in charge and four enlisted men as draughtsmen, and one enlisted clerk. The work of this subdivision, as shown below, shows a slight increase as compared with that of the year ending June 30, 1885. This increase of work is especially noted in the item of miscellaneous drawings.

Summary of work executed during fiscal year 1885–1886 *in the draughting room, Publications Division.*

Tri-daily and international monthly weather charts, reduced by pantograph	2,060
Tri-daily, monthly weather review, and other miscellaneous drawings and charts transferred to stone	656
Forms transferred to stone	17
International daily charts, prepared for transfer	240
Miscellaneous drawings and charts, completed	548
Drawings and maps backed with cotton	13
Printed charts inspected	225,000

Charts prepared in international subdivision of draughting room.

International daily weather charts, completed	365
International monthly weather charts, completed	12
International annual weather charts, completed	1
Miscellaneous charts, completed	20
Monthly weather review charts, completed	40
Data for monthly weather review, sets	12

PRINTING ROOM.

The force in the printing subdivision consists of 1 sergeant in charge, 7 printers, 4 lithographers, 1 proof reader, 3 pressman, 1 press-boy, 2 stitchers and folders, 1 engineer and 1 laborer. This force is divided into 15 enlisted men and 6 civilians. With the exception of the items, Daily Bulletin of International Observations and Signal Service Notes and Professional Papers, the work of this subdivision has been quite materially increased, as will be seen by the tabulated statement below. This increase has taken place in spite of the decrease of force, and of the fact that no improvements have been made in the office facilities during the year. The presses and machinery are old and are in need of overhaul

ing, and, in some instances, of replacement by new and improved machinery. Especially is this true of the lithographic facilities, which have long been inadequate for the work required of them. There has been a steady improvement in the quality of the work done in this subdivision, which compares very favorably with work done in private printing and lithograph establishments. The following is a detailed statement of the work done during the past year:

Statement of printing and lithograph work performed during the year ending June 30, 1886.

	No. of copies.
Printing:	
Daily bulletin of international observations	2,520
Special bulletin and indications	20,300
General orders	33,950
Special orders	16,213
Signal Service instructions	13,660
Signal Service circulars	43,450
Professional Papers	1,500
Signal Service Notes	1,500
Monthly Weather Review	32,570
Monthly Summary and Review of International Meteorology	7,560
Post-office wrappers	485,000
Letter-heads	9,660
Letters	17,320
Envelopes	602,900
Forms	618,728
Miscellaneous	127,479
Lithograph:	
Base maps	157,868
Morning maps, 7 a. m	126,717
International charts, daily	35,484
Monthly weather-review charts	218,115
Monthly summary charts	6,744
Tri-daily meteorological record charts	206,812
Letter-heads	29,560
Circulars	44,490
Forms	245,488
Miscellaneous	149,922

DISTRIBUTING ROOM.

The work of this subdivision consists in distributing the publications of the Service to the regular recipients and in answering applications for publications from parties who are not regularly listed for their receipt. To secure an economical and proper distribution of the various publications of the Service to the large number of co-operators with the Service and parties entitled by exchange to the favor, requires a large amount of bookkeeping. This work has been simplified and very much lessened by the opening of a new set of books, referred to in my last report, in which the lists of regular and casual recipients are handled in the most systematic manner possible. The limited number of surplus copies remaining after the regular lists have been filled requires careful scrutiny of, and discrimination in, the applications received for them. These applications are growing rapidly in number, and great care is taken to save the stores from improper and valueless distribution. The issue of the periodical publications of the office, the daily weather map, the Monthly Weather Review, and the monthly summary, has been carried on with promptness and with little complaint. To this subdivision also belongs the work of storing and preserving the "reserve publications." During the past year these publications have been overhauled and rearranged, entailing a large amount of labor. The work, however, was done at intervals, without interference with the current work of the division.

In conclusion, I am gratified to be able to say that I believe the division to be in better condition than at my last report as respects organization and efficiency.

F. B. JONES,
Captain and Assistant Quartermaster, A. S. O.,
In charge Publications Division.

The CHIEF SIGNAL OFFICER OF THE ARMY.

APPENDIX 17.

ANNUAL REPORT OF THE OFFICER IN CHARGE OF THE METEOROLOGICAL RECORD DIVISION.

WASHINGTON, D. C., *July* 9, 1886.

SIR: In compliance with memorandum instructions lately received, I have the honor to transmit herewith a report, in duplicate, of work in the Meteorological Record Division for the year ending June 30, 1886.

Since March 4 the work has progressed very slowly, owing to a reduction of the clerical force from eleven to three. With the latter number the work has been carried on at much disadvantage. A clerical force of five is the minimum that can be employed to carry on the work without loss of time.

Very respectfully, your obedient servant,

JNO. P. FINLEY,
Second Lieutenant, Signal Corps, U. S. A.

CHIEF SIGNAL OFFICER OF THE ARMY,
Washington, D. C.

Statement of work done in the Meteorological Record Division for the year ending June 30, 1886.

The work of the Meteorological Record Division, when completed in the printed form, assumes three distinct divisions:

(1) The tabular statement of data for the different stations.
(2) The map prepared from the data in this table.
(3) The synopsis and indications made from the same data.

In bringing the work to this form the following steps are necessary:

(1) Preparation from original records of manuscript for the table.
(2) Comparison of this table, when completed, with the originals.
(3) "Starring" or marking of stations from which reports were not received in time to be used in making the synopsis and indications.
(4) Entry upon charts of the data in the table.
(5) Comparison of these charts with the data from which they are made.
(6) The drawing of isobaric and isothermal lines and tracing the paths of storm centers on these charts, with a review of the same by some other officer than the one by whom they were drawn.
(7) The entry and comparison of synopses and indications made from the above data.
(8) Reading proof of the tabular statement and synopses and indications.
(9) Reading proofs (three) of maps.
(10) Preparation of Pacific slope maps for use of the officer in charge at San Francisco. This forms no part of the Meteorological Record, but has come to be a regular work in this division.

In the subjoined table the work performed is recorded under these different headings, the order of this statement being changed so that all of the different steps pertaining to each of the three ultimate divisions mav appear as one group:

Date.	MS. Record.				MS. Charts.							Synopses and indications.			Pacific slope maps.	
	Stations copied.	Stations compared.	Pages starred.	Pages of proof read.	Made.	Compared.	Lines drawn.	Lines reviewed.	First proofs read.	Second proofs read.	Third proofs read.	Entered.	Compared.	Written, but not compared.	Made.	Compared.
July, 1885	97	57		59	50	53	57						90		372	465
Aug., 1885	2		183	96	15	12			9				183		1,239	1,464
Sept., 1885	53			108	2		12		57		33				1,185	462
Oct., 1885				8	347	230	142		118	120	52	10	10		104	813
Nov., 1885		201		8	425	207	75									
Dec., 1885	32	178			333	56	30		38	36	46				360	360
Jan., 1886	287				237	765	74		93	56	60			94		
Feb., 1886	768						81		62	72	52			152		
Mar., 1886	144	283						6	20	45	41			50		
Apr., 1886		63			108					4				14	183	
May, 1886		159			75						8				93	
June, 1886	13	163		16	93						16				93	369
Totals	1,396	1,104	183	295	1,685	1,323	471	6	397	333	308	10	283	310	3,629	3,933

NOTE.—Old records were corrected as follows: Cairo, barometer for 19 months; Cincinnati, for 12 months; Indianapolis, 14 months; Fort Davis, 5 months; Los Angeles, 16 months; Louisville, 16 months; Rochester, 6 months; Saint Louis, 13 months; Saint Vincent, 10 months; and Yuma, 2 months. Two pages of January, 1882, record were recopied. The thermometer readings in the Uglaamie record were corrected to agree with the printed official report, and relative humidity substituted for the readings of the wet-bulb thermometer for the entire period during which the station had been maintained. Time equal to about two months' work for one person was given to examination and special report upon work already done and to the correction of such imperfections in the synopses and indications as could be done without reference to the original copies. A series of fourteen maps, January, 1886, 6th, 3 p. m. to 10th, 11 p. m., was made for the Indications' Division from the original records.

APPENDIX 18.

REPORT OF TORNADO WORK.

SIGNAL OFFICE, WAR DEPARTMENT,
Washington City, July 8, 1886.

SIR: In compliance with instructions lately received, I have the honor to forward herewith, in duplicate, a report on tornado work for the year ending June 30, 1886.

I am, very respectfully, your obedient servant,

JNO. P. FINLEY,
Second Lieutenant, Signal Corps, U. S. A.

The CHIEF SIGNAL OFFICER, U. S. A.,
Washington, D. C.

List of voluntary tornado-reporting stations of the United States Signal Service, by States, for the fiscal year ending June 30, 1886.

State.	Number of stations.	State.	Number of stations.
Alabama	82	Mississippi	29
Arkansas	26	Missouri	71
California	1	Nebraska	84
Colorado	15	New Hampshire	1
Connecticut	1	New Jersey	6
Dakota	38	New York	37
Florida	2	North Carolina	128
Georgia	141	Ohio	51
Illinois	38	Pennsylvania	76
Indiana	50	Rhode Island	1
Indian Territory	1	South Carolina	114
Iowa	83	Tennessee	32
Kansas	131	Texas	60
Kentucky	35	Vermont	1
Louisiana	10	Virginia	3
Maine	5	West Virginia	1
Massachusetts	6	Wisconsin	102
Michigan	23		
Minnesota	77	Grand total	1,562

Stations in operation June 30, 1885	1,385
Stations added during the past fiscal year	177
Stations in operation June 30, 1886	1,562

Statement of work performed in Tornado Division since April, 1882, when I assumed charge, to June 30, 1886.

Subject.	Prepared and published.	Sent.	Received.	Made.	Stations opened.	Pages indexed.	Pages entered.	Supplied.	Months made.	Names listed.
Tornado circulars	23									
Professional papers	4									
Signal-Service notes	1									
Tornado predictions									*12½	
Communications received			9,116							
Reports received on regular forms			2,039							
Newspaper clippings made and placed in scrap-books							1,298			
Tornado abstracts for fact room									18	
Tornado-reporting stations					1,562					
Charts of temperature and wind directions, prepared for days on which tornadoes occurred				105						
Letters sent		20,236								
Indexing letters-sent books						10,734				
Preliminary tornado charts	224									
State tornado maps								775		
Mailing list furnished the Publications Division										1,562
Charts for tornado predictions				1,576						

* Seasons of 1884, 1885, and 1886.

Statement of work performed in Tornado Division during the fiscal year ending June 30, 1886.

Subject.	Prepared and published.	Sent.	Received.	Made.	Stations opened.	Pages indexed.	Pages entered.	Supplied.	Months made.	Names listed.
Tornado circulars	2									
Professional papers	1									
Signal-Service notes	0									
Tornado predictions									*	
Communications received			1,968							
Reports received on regular forms			563							
Newspaper clippings made and placed in scrap-book							600			
Tornado abstracts for fact room									9	
Tornado-reporting stations					177					
Letters sent		6,409								
Indexing letters-sent books						800				
Preliminary tornado charts	†112									
State tornado maps								59		
Mailing list furnished the Publications Division										177
Charts for tornado predictions				518						

* Eight months and twenty days, seasons of 1885 and 1886.
† Prepared, but not published.

MISCELLANEOUS.

One professional paper is now in course of preparation, upon which the following work has been accomplished: Thirty-four State maps have been carefully drawn on tracing paper, upon which has been located the tracks of all of the tornadoes reported as occurring in the various States and Territories since the 10th of June, 1682. Two hundred and fourteen pages of tabulated tornado records have been prepared, embracing the period from 1682 to 1885, inclusive.

Fifty-five pages of sundry matter, mostly tables, have also been prepared.

It will require about one month of steady work to complete the manuscript for this paper.

During the year ending June 30, 1886, the manuscript for a paper entitled "Charts of Storm Frequency for a portion of the North Atlantic Ocean" was prepared and submitted.

Nearly three months' work for one man was given to the examination of old records in the Congressional Library and in the office of the Chief Signal Officer for the purpose of obtaining information concerning the occurrence of past tornadoes.

Card indices for over 1,500 storms were prepared for the tornado and local storm record books.

Very respectfully, your obedient servant,

JNO. P. FINLEY,
Second Lieutenant, Signal Corps, U. S. Army.

APPENDIX 19.

REPORT OF THE ASSISTANT IN CHARGE OF THE STUDY DIVISION.

STUDY DIVISION, *July* 15, 1886.

SIR: I have the honor to submit the following report of work done in the Study Division during the year ending June 30, 1886:

The work assigned to this division may be arranged under the following heads:

SCIENTIFIC CORRESPONDENCE.

Six hundred and forty letters relating to scientific matters have been referred to this room, on which appropriate action has been suggested. Among these, those requiring special attention related to questions in hygrometry, hypsometry, evaporation, solar radiation, thunder storms, tornadoes, sun spot and lunar influences on the atmosphere, cloud measurements, new stations, and publications.

ACCURACY OF ARCTIC GEOGRAPHY.

A thorough examination was made as to the reliability of the sextant observations made by Lieutenant Lockwood during his sledge journey on the north coast of Greenland, in which he reached the "farthest north," and the results were found to be highly satisfactory. The report thereon, made by G. E. Curtis, will appear as an appendix to Lieutenant Greely's official report of the expedition to Lady Franklin Bay.

TABLE FOR REDUCTION OF OBSERVATIONS.

The table of monthly constants for reduction of the barometer to sea level has been corrected for current changes, which are given in Appendix A. The usual reprint of the table has not been made, owing to the fact that a much improved method has been prepared to replace it. Much time has been given in this division to the discussion of the details of the proposed system of reducing the barometer to sea level, and finally all papers were referred to Professor Ferrel, with instructions to decide on the questions at issue and to prepare the tables.

LOCATIONS OF STATIONS.

The latitude, longitude, elevation, and magnetic variation of Signal Service and voluntary stations have been furnished as needed. In proportion as the barometric work of the service becomes more accurate, the errors of crude railroad levelings become more troublesome, so that it is becoming more and more desirable that the elevations of our stations should be based upon accurate levels made by the Coast and Geodetic Survey. A table compiled by Professor Hazen, containing the elevations of the barometers at all stations in the service on January 1, 1885, is given in Appendix B, together with all changes since that date.

EXPOSURE OF INSTRUMENTS.

(*a*) *Barometer.*—No change has been made during the year, but I consider it of increasing importance for this office to make the investigation recommended in my last annual report as to the influence of wind upon the pressure within the observer's room. A schedule of preliminary observations at Mount Washington bearing upon this point has been submitted and approved.

(*b*) *Thermometer.*—The question as to the proper exposure of thermometers in order to obtain the temperature of the air in their immediate neighborhood having been decided by the adoption of the whirling thermometer inside of a light and open wooden shelter, the principal remaining question for this division has been the location of the shelters. For local climatology these should evidently be placed so as to give the local temperatures with all their peculiarities; but for weather predictions or general dynamic

meteorology, the shelter should be so placed by elevation or otherwise as to give a temperature representative of a large mass of air. The inspection reports are regularly examined, and special inquiries are made for the purpose of detecting any irregularities in Signal Service exposures.

(c) *Anemometer and rain-gauge.*—Special comparative observations have been made during the year between anemometers located in and around Washington, and a report has been made upon the relative velocities recorded at neighboring Signal Service stations throughout the country.

Observations on the influence of exposure upon the collection of the rain-gauge have continued to be made at about one-third of the Signal Service stations, including a special series at Mount Washington. From all these it is evident that a correct determination of the general wind velocity and precipitation can be obtained only by locating the instruments away from the disturbing influences of the buildings upon which they are at present very generally exposed. Even in improved locations outside of city limits it will still be important to determine the small coefficients necessary to correct the anemometer readings for the effect of exposure and locality, and a plan to that end is now in hand.

Solar radiation thermometer.—Studies as to methods of eliminating the effect of exposure upon the Arago-Davy actinometer have been postponed in anticipation of the receipt of the standard instrument ordered over a year ago. Meanwhile the theory of the auxiliary apparatus has been more carefully elaborated and the experimental work as planned will be submitted to the physical laboratory for execution.

TIME.

A full report has been submitted upon the details of the construction of the standard clock and the method proposed for securing standard time of the highest accuracy for the use of our stations. This report completes the transfer of this work to the physical laboratory.

BALLOON OBSERVATIONS.

The report of results obtained by Private W. H. Hammon has been completed under my own and Professor Mendenhall's joint supervision, and an introductory chapter by myself has been partly written. The temperatures and humidities observed by him are of so high a degree of accuracy as to justify special care in their comparison with meteorological laws.

Through the kindness of Messrs. James Allen & Son, of Providence, R. I., an opportunity was afforded for making meteorological observations in a balloon on June 24, 1886. This duty was assigned to junior professor H. A. Hazen at his request, and his report has been submitted.

On account of the importance of securing the fullest information as to the construction and management of balloons for both military and meteorological purposes, Prof. S. A. King was temporarily engaged and assigned to the duty of compiling a manual on ballooning. This work was completed and will, it is hoped, be printed for the use of the service. The importance of balloon observations in the study of the atmosphere has been urged of late by meteorologists, both theoretical and practical. The anomalous phenomena frequently observed stimulate to a more thorough study of the atmosphere by this means.

INSTRUCTION.

The course of instruction for lieutentants at this office has included a series of fifty-eight lectures of about two hours each by myself, covering the following subjects: Meteorological apparatus, meteorological chartography, the various optical and thermal phenomena due to moisture, the vertical distribution of temperature, pressure and moisture, some of the results of Ferrel's, Guldberg and Mohn's, Oberbeck's, and Sprung's studies into the development and movement of storms. These lectures can be prepared as a text-book for the use of the office. Prof. W. M. Davis, of Harvard University, has reported progress in the preparation of an elementary text-book on meteorology.

MISCELLANEOUS.

Considerable attention has been given to the character and usefulness of the sunset weather predictions telegraphed at midnight for the use of the indications officer; reports thereon have been submitted recommending improvements. Much of my time during the year has been given to work as a member of the board on verifications, the board on publications, and the board of professors.

PUBLICATIONS.

The following published articles have been prepared by Prof. H. A. Hazen:

The Condensing Hygrometer and the Psychrometer, American Journal of Science, December, 1885; Determination of Air Temperature, American Meteorological Journal, October, 1885; Notes on Professor Wild's article on the determination of air temperature, American Meteorological Journal, January, 1886; Thermometer Exposure, American Meteorological Journal, June, 1886.

The following papers prepared by members of this division have been accepted for publication but not yet printed:

Recent mathematical papers: Professional paper No. VIII, Part II, by Junior Professor Frank Waldo.

Note on a solar fog-bow, by Junior Professor Frank Waldo.

Report on barometric comparisons in Europe and the United States; abstract of the same; by Junior Professor Frank Waldo.

Report on the standard clock; by Junior Professor Frank Waldo.

Charts of storm-tracks for the North Atlantic Ocean; by Lieutenant J. P. Finley.

Balloon manual; by Professor S. A. King.

Sun spots and weather predictions; by Professor Cleveland Abbe.

Thunder storm of 1884; by Junior Professor H. A. Hazen.

Report on the sextant observations made by Lieutenant Lockwood on the north coast of Greenland; by G. E. Curtis.

The following translations have been prepared for the use of this office:

Report to the international committee, August, 1886, on observations of clouds.

Discussions in the Comptes-Rendus on the effect of the earth's rotation on moving bodies.

BIBLIOGRAPHY.

The compilation of a complete subject and author index to the literature of meteorology has been continued under the special supervision of Mr. C. J. Sawyer, who submits the following report:

On July 1, 1885, the bibliography consisted of a card author catalogue of 47,191 titles, 22,191 having been added by me to the material on hand at my assignment as editor of the bibliography, March 4, 1884. The work of the past year has been chiefly the collection of new titles, the correction and completion of those already on hand, the formation of a subject classification, the actual classification of the titles by subjects, and the preparation of an author index.

The work of collecting material has consisted of indexing periodicals, the examination of printed catalogues and special bibliographies, and manuscript catalogues and bibliographies furnished by co-operating scientists, chiefly abroad, and of the incorporation of new titles from 147 lists of their works furnished by individual authors.

The net additions during the year, and the total number of titles in the bibliography at present, are as follows:

	New titles.
Periodicals, 3,375 volumes	3,588
Published catalogues and bibliographies, 183 volumes	1,259
Manuscript catalogues and bibliographies	833
Author's lists (5,000 titles)	899
Total additions 1885–'86	6,579
Titles in bibliography July 1, 1885	47,191
Titles in bibliography July 1, 1886	53,770

In addition to the new titles obtained, this work has been of the greatest importance in affording a constant means of correction and completion of the titles already on hand. The author's lists are especially valuable in insuring a full and accurate representation of the works of their respective compilers.

The most important special collection work of the year has been the incorporation of the meteorological titles from the card catalogue of the Signal Office library, and from the index catalogue of the Surgeon-General's office. I am indebted to Dr. J. S. Billings for permission to examine the unpublished portion of the latter catalogue, and for facilities afforded for periodical indexing in the library of the office.

The classification adopted is based on a plan prepared, at the request of this office, by Dr. A. Lancaster, of Brussels, which, after careful study and full revision, was submitted for criticism to several gentlemen especially interested in the subject. I am indebted for valuable suggestions to Prof. T. C. Mendenhall, of this office; Prof. Winslow Upton,

of Brown University; Mr. W. M. Davis, of Harvard College; Prof. G. J. Symons, of London; Prof. E. S. Holden, of the University of California; Prof. E. Loomis, of Yale College, and to the members of the study-room.

The classification of titles was begun about February 1, and, with the preparation of the author index, has constituted the chief work since that time. With this work of classification, however, is combined that of a careful revision of the material on hand. Constant effort is made to supply omissions and to insure fullness and accuracy; periodical indexing is continued as volumes desired are obtained, and correspondence is maintained with authors in this country and abroad. The greatest difficulty is experienced in securing a complete representation of the publications of the various meteorological observatories and services, especially the earlier series of observations. To the courtesy of the present directors of these institutions I am indebted for much valuable information furnished at the request of this office.

Classification by titles is so unsatisfactory that reference to the works themselves is often absolutely indispensable, and always desirable. For this purpose I have drawn upon all available resources and am under great obligations to the librarians of the city for special faciiities for reference afforded me.

The form of author index adopted is that employed by Drs. Houzeau and Lancaster in their "Bibliographie générale de l'astronomie," giving under the author, for each title, first, an abbreviation of the subject subdivision under which it is classed; second, the date of publication; third, the reference. The index is being prepared by my assistant, private E. H. Hilton, to whose systematic and thorough work the value of the bibliography and index will be largely due.

The classification has now advanced to "Fe," embracing about 15,000 titles, and the author index to "Du," including about 3,365 authors. The progress in classification was necessarily slow at first, the work being largely experimental, but the present rate of progress is such as to insure the completion of the preliminary classification and author index and their revision during the present year.

In the work on the bibliography constant regard has been paid to the possible necessity for its use as a card catalogue until provision be made for its publication, and both the subject catalogue and author index are in the best form yet invented for such use. But a card catalogue is available to but few, and is adapted for use by a librarian preliminary to printing and for securing a catalogue always up to date only. For general reference it can never take the place of a published catalogue. The completeness and accuracy of the bibliography has been rendered possible only by the hearty co-operation of foreign meteorologists and librarians, and the constant assistance received from them renders the work an international one, and emphasizes the absolute necessity of an immediate publication. It is of the greatest importance, not only to our office, but to the scientific world at large, by whose aid it has been compiled.

In my original report, dated March 14, 1884, shortly after my assignment in charge of the bibliography, I estimated the final number of titles to January 1, 1882, as 40,500; the delay in publication has permitted more extensive additions than then contemplated, and the following estimates, based on the revision and classification of the first 15,000 titles of the bibliography, may be of interest:

Of the whole number of titles in the bibliography, about 52,000 are previous to January 1, 1882, the limit of the bibliography as originally planned and as now under classification; the balance form an incomplete supplementary catalogue of later publications. Careful estimates show that the 52,000 titles will be reduced in revision and classification to about 47,000; this number will be increased by double classification to about 50,000, of which 5,000 will be classed as observations, to be arranged later by countries and districts, with indices of places, observers, and periods. Of the balance, about 42,500 belong to meteorology proper, and 2,500 to terrestrial magnetism.

The future work will be the completion and revision of the classification and author index, preparation of a periodical list and alphabetical subject index, followed by final revision of titles and technical preparation for publication when provided for.

THUNDER-STORMS.

The collection and study of thunder-storm data has been carried on under the special supervision of Prof. H. A. Hazen, who submits the following report:

The work of collecting special thunder-storm reports, undertaken in 1884, has been continued. A special thunder-storm form for the use of the regular Signal Service observers has been prepared, and these records are now directly comparable with those by special observers. Nine thousand one hundred and forty-five special reports have been received and filed, in addition to the reports of voluntary and Signal Service observers. A report on the thunder-storms of 1884 has been prepared for publication. There has also been prepared and published in the Monthly Weather Review for October, 1885, a

note on the connection between tides and thunder-storms; reports on thunder-storms for April and May, 1886, have been compiled from all records available, and printed in the numbers of the Weather Review for the corresponding months. Very extended records of the thunder-storms accompanying the destructive storms of September 8, 1885, in Ohio, have been collected and a study of them has been begun.

TORNADOES.

The collection and study of tornado data was carried on as hitherto under the general supervision of Lieutenant Finley, until its removal, May 13, 1886, to a separate division entirely under his control.

Reports on methods of verifying tornado predictions have been made by Prof. H. A. Hazen and Sergt. G. E. Curtis.

In general the quantity of work accomplished in this division during the past year has been materially diminished, not only by the diminution of clerical force and the transfer of the tornado subdivision, but also by the illness of Professor Waldo, who has been on sick leave, and by reason of an unfortunate accident to myself.

Respectfully submitted.

CLEVELAND ABBE,
Professor and Assistant.

The CHIEF SIGNAL OFFICER OF THE ARMY.

APPENDIX 19 A.

The following additions to and changes in the table of monthly constants for the reduction of barometric observations to sea level and standard gravity, as issued in General Orders No. 6, 1885 (and published as Appendix 66 b, annual report of the Chief Signal Officer for 1885), have been authorized during the year ending June 30, 1886:

Station.	Elevation.	Combined reduction constant (gravity and elevation) for each month.											
		Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Portland, Oreg[1]	80	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
Concordia, Kans[2]	1,384	1.54	1.53	1.51	1.47	1.42	1.40	1.39	1.39	1.42	1.46	1.51	1.54
Valentine, Nebr[2]	2,603	2.86	2.84	2.80	2.72	2.63	2.57	2.56	2.56	2.63	2.70	2.81	2.88
San Luis Obispo, Cal[3]	270	0.27	0.27	0.27	0.27	0.26	0.26	0.26	0.26	0.26	0.26	0.27	0.27
Abilene, Tex[2]	1,745	1.88	1.88	1.85	1.82	1.79	1.75	1.76	1.74	1.79	1.82	1.89	1.90
Ft. Stockton, Tex[1]	B 3,000	3.10	3.09	3.04	2.99	2.97	2.88	2.90	2.90	2.92	2.99	3.08	3.10
Ft. Totten, Dak[4]	1,490	1.77	1.75	1.72	1.66	1.59	1.56	1.54	1.55	1.59	1.64	1.71	1.80
Walla Walla, Wash[3]	1.018	1.15	1.15	1.12	1.11	1.09	1.08	1.06	1.07	1.08	1.11	1.13	1.14
Yankton, Dak[5]	1,231	1.43	1.43	1.39	1.35	1.29	1.28	1.27	1.27	1.30	1.34	1.39	1.44
Vicksburg, Miss[6]	222	0.21	0.21	0.21	0.20	0.20	0.20	0.20	0.20	0.20	0.21	0.21	0.21
Los Angeles, Cal[7]	339	0.34	0.34	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.34
Sanford, Fla[7]	B 25	−0.01	−0.01	−0.01	−0.01	−0.01	−0.01	−0.01	−0.01	−0.01	−0.01	−0.01	−0.01

[1] Moved August 1, 1885.
[2] New station.
[3] Revised elevation.
[4] Moved Nov. 1, 1885.
[5] Moved May 1, 1886.
[6] Moved May 11, 1886.
[7] Revised elevation.
B = Barometric determination.

APPENDIX 19 B.

Study Division—Annual report.

Latitude, longitude, and elevation of Signal Service barometers.

Stations.	Latitude.	Longitude.	Elevation January 1, 1885.	Remarks.
	° ′	° ′	*Feet.*	
Abilene, Tex	32 14	99 45	....	Established June 30, 1885. H=1,744 feet.
Albany, N. Y	42 39	73 45	83	
Alpena, Mich	45 5	83 30	609	
Apache, Fort, Ariz	33 48	109 57	5,050 B	
Assinaboine, Fort, Mont	48 32	109 42	2,720 B	
Atlanta, Ga	33 45	84 23	1,129	
Atlantic City, N. J	39 22	74 25	13	
Augusta, Ga	33 28	81 54	183	
Baltimore, Md	39 18	76 37	45	
Barnegat City, N. J	39 46	74 6	22	
Behring's Island, Behring Sea	55 12	East 165 55	20	
Bennett, Fort, Dak	44 43	100 39	1,510 B	
Benton, Fort, Mont	47 50	110 40	2,681 B	
Bidwell, Fort, Cal	41 53	120 11	....	Established September 9, 1885.
Bismarck, Dak	46 47	100 38	1,694	
Block Island, R. I	41 10	71 36	27	
Boise City, Idaho	43 37	116 8	2,750 B	
Boston, Mass	42 21	71 4	124	
Bridger, Fort, Wyo	41 28	110 30	....	
Brownsville, Tex	25 53	97 26	57	
Buffalo, N. Y	42 53	78 53	690	
Buford, Fort, Dak	48 0	103 56	1,930 B	
Cairo, Ill	37 0	89 10	359	
Canby, Fort, Wash	46 16	124 4	179	
Cape Henry, Va	36 56	76 0	16	
Cape May, N. J	38 56	74 58	27	
Cape Mendocino, Cal	40 26	124 24	637	
Cedar Keys, Fla	29 8	83 2	22	
Charleston, S. C	32 47	79 56	52	
Charlotte, N. C	35 13	80 51	808	
Chattanooga, Tenn	35 4	85 15	783	
Cheyenne, Wyo	41 8	104 48	6,105	
Chicago, Ill	41 52	87 38	661	
Chincoteague, Va	37 55	75 23	8	
Cincinnati, Ohio	39 6	84 30	612	Moved March 1, 1885. H=628 feet.
Cleveland, Ohio	41 30	81 42	690	
Columbus, Ohio	39 58	83 0	812	
Concho, Fort, Tex	31 25	100 24	1,900 B	
Concordia, Kans	39 35	97 41	....	Established May 1, 1885. H=1,384 feet.
Custer, Fort, Mont	45 42	107 34	3,040 B	
Davenport, Iowa	41 30	90 38	615	
Davis, Fort, Tex	30 38	103 56	4,928, B	
Dayton, Wash	46 19	117 56	1,683, B	
Deadwood, Dak	44 23	103 43	4,600, B	
Denver, Colo	39 45	105 0	5,294	
Des Moines, Iowa	41 35	93 37	819	
Detroit, Mich	42 20	83 3	662	
Dodge City, Kans	37 45	100 0	2,517	
Dubuque, Iowa	42 30	90 44	665	
Duluth, Minn	46 48	92 6	672	
Eastport, Me	44 54	66 59	61	
Elliott, Fort, Tex	35 30	100 21	2,650, B	
El Paso, Tex	31 47	106 30	3,764, B	
Erie, Pa	42 7	80 5	681	
Escanaba, Mich	45 48	87 5	613	Moved August 8, 1885. H=608 feet.
Fort Smith, Ark	35 22	94 24	451	Moved February 1, 1885. H=470 feet.
Frisco, Utah	38 25	113 16	....	Established January 25, 1885. H=[illegible]
Galveston, Tex	29 18	94 47	40	
Grand Haven, Mich	43 5	86 18	629	
Grant, Fort, Ariz	32 39	109 57	4,856, B	
Greencastle, Ind	39 39	86 51	807	
Hatteras, N. C	35 15	75 40	12	
Helena, Mont	46 34	112 4	4,069	
Huron, Dak	44 21	98 9	1,307	
Indianapolis, Ind	39 46	86 10	766	
Indianola, Tex	28 32	96 31	26	
Jacksonville, Fla	30 20	81 39	43	

Latitude, longitude, and elevation of Signal Service barometers—Continued.

Remarks.
Established July 1, 1885. H=3,[illegible] feet.
Established Feb. 26, 1885. H=1,[illegible] feet.
Established Nov. 1, 1885. H=?
Moved April 1, 1886. H=169.'
Established Feb, 1, 1885. H=14'.
Moved July 1, 1885. H=99'.
Moved August 1, 1885. H=80'.
Moved July 1, 1885. H=531'.
Established March 7, 1885. H=781'.
Established June 1, 1885. H=270'.
Established Nov. 1, 1885. H=?
Moved Aug. 1, 1885. H=3,004B.

Latitude, longitude, and elevation of Signal Service barometers—Continued.

Stations.	Latitude.	Longitude.	Elevation January 1, 1885.	Remarks.
	° ′	° ′	*Feet.*	
Sully, Dak	44 39	100 39	....	Established Nov. 24, 1885. H=?
Tatoosh Island, Wash	48 23	124 44	86	
Thomas, Fort, Ariz	33 4	110 2	2,710 B	
Toledo, Ohio	41 40	83 34	651	
Totten, Fort, Dak	47 57	98 57	1,500	Moved Oct. 1885. H=1,490′; and May 1, 1886. H=1,487′.
Unalaska, Alaska	53 53	166 32	13	
Valentine, Nebr	42 50	100 32	....	Established Sept. 1, 1885; H=2603.
Vicksburg, Miss	32 22	90 53	244	Moved April 21, 1885; H=252. June 1, 1885, 209′; May 11, 1886. H=222′.
Walla Walla, Wash	46 2	118 20	....	Established Nov. 25, 1885. H=1018
Washington City	38 54	77 3	106	
West Las Animas, Colo	38 4	103 12	3,899	
Wilmington, N. C	34 14	77 57	52	
Winnemucca, Nev	40 58	117 43	4,358	
Yankton, Dak	42 54	97 28	1,228	Moved May 1, 1886. H=1234.
Yuma, Ariz	32 45	114 36	141	

APPENDIX 20.

REPORT OF OFFICER IN CHARGE OF THE FACT AND INTERNATIONAL BULLETIN DIVISION.

SIGNAL OFFICE, WAR DEPARTMENT,
Washington City, June 30, 1886.

GENERAL: I have the honor to submit herewith a brief statement of the work of the Fact and International Bulletin Division during the year ending June 30, 1886, as called for by memorandum No. 167.

I am, very respectfully, your obedient servant,

H. H. C. DUNWOODY,
First Lieutenant, Fourth Artillery, Acting Signal Officer and Assistant.

The CHIEF SIGNAL OFFICER OF THE ARMY.

FACT AND INTERNATIONAL BULLETIN DIVISION.

The Monthly Weather Review of the Signal Service has been regularly published during the year, and, with increased facilities for securing reliable data, it forms one of the most valuable publications of this service. Each Review contains a general summary of the meteorological data collected by this office during the month. The introduction gives a brief statement of the weather conditions throughout the country and the probable effect of the same upon the agricultural products of each section. The monthly means of temperature and rainfall, compared with the normal temperature and average rainfall for each district, are published in tabular form. Similar tables referring specially to the cotton region are given, based upon cotton-region reports. These tables have increased in value, as they afford means of comparison between the meteorological conditions and their probable effect upon the crop.

The increased number of marine reports which are received in time to be utilized in tracing storms from the continent over the North Atlantic, render it possible to more accurately give the probable tracks of these storms on the monthly charts accompanying the Review, thus affording information specially valuable to shipmasters.

The Monthly Summary and Review of International Meteorological Observations contains a summary of the reports published in the International Bulletin and a general discussion of the meteorological conditions prevailing over the Northern Hemisphere. These observations have been published since 1873, and furnish a valuable collection of data for the solution of the great problems of meteorology.

It is within the province of this division to investigate atmospheric phenomena of an unusual nature embodied in reports received; to deduce results therefrom, and cause the same to be issued as special charts or publications. A number of these special papers have been compiled and published during the past year, and embrace data of great importance and practical value.

APPENDIX 21.

ANNUAL REPORT OF SIGNAL SERVICE AGENCIES.

NEW YORK CITY, *July* 3, 1886.

SIR: I have the honor to transmit the following report on Signal Service agencies for the past fiscal year:

For the benefit of commerce agencies have been maintained in Boston, Philadelphia, and New York City, where 4,072 ships' barometers were compared with Signal Service standards, errors determined, and correction cards furnished.

Simultaneous observations during the year have been received on Forms 123, from 352 steamers and 156 sailing vessels, showing an increase of 89 since last report. In addition to this the New York Herald weather bureau supplied the service with reports from 73 vessels, which, added to our own, makes a grand total of 581 vessels on which observations have been made for the weather bureau. In connection with this the number of forms examined amounted to 5,486, and the number of letters and acknowledgments prepared and forwarded reached 3,739. Letters received numbered 570.

Abstracts of logs from vessels to the number of 557 have been prepared and forwarded; besides, the New York Herald furnished us with 171, and the New York Maritime Register with 521 additional.

Storm reports were received to the number of 776.

Cablegrams to London were forwarded during the year to the number of 99 from New York agency, and from agency at Boston 26 were sent.

These telegrams gave specific data obtained from incoming steamers, showing location of icebergs and derelict ships observed, and position and bearing of storms encountered west of the forty-fifth meridian.

The relations between the shipping interests and the Signal Service agencies are extremely pleasant. The weather bureau stands better to-day than it has ever stood before with commercial interests of the country.

Very respectfully, your obedient servant,

H. J. PENROD,
Sergeant, Signal Corps, U. S. Army.

The CHIEF SIGNAL OFFICER OF THE ARMY.

APPENDIX 22.

ANNUAL REPORT OF THE ASSISTANT IN CHARGE OF THE PHYSICAL LABORATORY DIVISION.

WASHINGTON CITY, *July* 19, 1886.

SIR: I have the honor to report as follows concerning the work of the Physical Laboratory Division during the fiscal year ending June 30, 1886:

The number of instruments received and issued within the year reached nearly five thousand. The greater part of the work of receiving and issuing instruments is done in what is known as the "instrument room." Packing is done there and all records in reference to the condition and location of the instruments are kept there. Several improvements in the method of packing have been introduced through which the number of breakages occurring in transit has been greatly diminished. A few changes in the method of keeping the accounts and records have also been made with the object of enabling the complete history of every article handled to be more immediately accessible.

Nearly two hundred and fifty barometers were compared in this room, with the substandards provided, and over one hundred anemometers were tested. All barometers are here repaired and filled, requiring the distillation of 300 pounds of mercury during the year. Considerable attention was given to the improvement of the self-registering instruments. Ink pens have been substituted for pencils, and the records have been greatly improved in this way. As a check upon the care with which the record sheets are placed, one sheet has been taken, at random, and without previous notice, each month and carefully compared with the regular records of the non-registering instruments. At least 1,500 people have visited the room during the year, requiring a great deal of time from an attendant in explaining the operations of the various instruments.

Work in the other rooms occupied by the division consisted largely of the comparison of thermometers and rain-gauges, together with the study of instruments with a view to their improvement, the suggestions of new forms, &c. Much time during the year was given to the preparation of detailed specifications, with drawings of the various instruments used by the service, to enable the property officer to make purchases in accordance with the requirements of the law. New forms have been introduced, and experimental studies of instruments have been made, as will be seen in the following brief résumé:

Barometers.—Considerable progress toward the establishment of a normal barometer was made during the year. A cathetometer for use in connection with the same was made by the Societé Genevise according to plans prepared in the division. It has been received and is found to be entirely satisfactory. Some experiments were also made to determine the best method of reading the height of a mercurial column, such as will be used in the new normal. On the last two days of each month comparison of the five standard barometers now in the office were made, and to increase the accuracy of reduction to a common level a precise measurement of the difference in the elevation of those in the "instrument room" and those in the testing room was made. A study was made of the temperature of the mercury at different points in the column of an ordinary barometer for the purpose of determining the accuracy with which the same is represented by that of the attached thermometer.

Thermometers.—Careful comparison of fourteen substandards received from Kew were made with substandards already in the office, which had previously been compared with the air thermometer, and a report on the comparison of substandards with the air thermometer was furnished and is now ready for publication.

Nearly a thousand working thermometers were compared with the office substandards, more than one-quarter of the number being for persons not connected with the service. The comparison generally extended from $-28°$ F. to $+112°$ F. A study of the relative sensitiveness of spherical and cylindrical bulb thermometers was made, at the conclusion of which an order was issued by the Chief Signal Officer declaring that the latter form should in the future be used to the exclusion of the former, except in the case of maximum and minimum thermometers. As it had been suspected that the indices of mini-

mum thermometers were sometimes jarred out of their proper position by wind, passing railway trains, &c., the question was made the subject of experiment, resulting in a recommendation that the thermometers be placed in a horizontal position instead of inclined as was previously the custom.

Psychrometers.—The subject of hygrometry received a good deal of attention in the early part of the year. A large number of comparisons of the sling psychrometer and dew-point apparatus under varying conditions of temperature and humidity, together with those made on Pike's Peak and elsewhere, furnished the necessary data for the computation of reduction tables for the whirling psychrometer.

A machine for whirling the thermometers was devised and adopted, and the operation of supplying stations with the new instrument was commenced. Fifty stations were first selected to which machines were sent. A further issue of fifty will very shortly be made. For purpose of comparison the old wet and dry bulb psychrometer will remain at these stations for a few months and will be read regularly with the new instruments.

Anemometers.—Improvements were made in the anemometer, consisting mainly of the introduction of oil-cups at both the upper and lower bearing of the spindle. The importance of securing a better standard of anemometry has been constantly recognized, but, owing to a lack of facilities, no steps in that direction have been taken. Under these circumstances it was deemed desirable to preserve the existing standard as carefully as possible, and to this end two new anemometers were selected, which agreed very closely with that so long in use. These were accepted as representing the standard, one of them being used daily for purpose of comparison, and the other being set aside for periodic comparison with the first.

Anemometer supports.—Considerable difficulty has always been experienced in the use of the anemometer support of the telescopic form. A new form was adopted in the past year which it is believed will be free from any serious objections. Unfortunately its use requires a good deal of roof-space, so that at a few of the stations either the telescopic rod or the T-iron support first used about two years ago must be retained.

Rain-gauges.—The new 8-inch rain-gauge is being introduced with considerable rapidity. Nearly one hundred and fifty were received during the year. All are carefully calibrated, and a correction-card is furnished with each. A large number of cheap rain-gauges, 3 inches in diameter, were furnished to the observers in the cotton-belt region.

Wind vanes.—Preparations have been made for the introduction of smaller vanes than have generally been in use. The large 16-foot vane is unquestionably too sluggish in its action, and it is proposed to substitute one not unlike what is known as the "sunset vane" wherever new vanes are required. As this vane has possibly too great freedom of movement, a method of damping its motion has been proposed and will be tried.

Atmospheric electricity.—Much progress was made in the study of this subject during the year. For the purpose of investigating electrometers, collectors, and exposures, a "mast" was erected on the roof of the building 1704 G street, by means of which two collectors can be simultaneously exposed at a height of 40 feet above the roof. During the winter numerous experiments were made with water-dropping collectors, at various heights, and joined to different electrometers. Specifications for a modified form of Mascart's electrometer were prepared, and six instruments were ordered for use during the present year.

In January several new stations for special observations in atmospheric electricity were established by order of the Chief Signal Officer, and through the courtesy of the authorities of several educational institutions. The new stations are at New Haven (Yale College), Ithaca (Cornell University), Columbus (Ohio State University), and Boston (Institute of Technology). The latter station was established on the removal of that previously existing at Cambridge. The station at Baltimore has continued as before. The following assignments to these stations were made: Columbus, Sergeant McRae; Ithaca, Private Hammon; New Haven, Private Fassig; Boston, Private Schultz. The station at Baltimore has continued in charge of Sergeant Morrill.

Photographic registration was maintained at Baltimore. At the other stations observations are made at stated intervals. At Columbus, Ithaca, and New Haven the observations have been carried on by the use of the electrometers belonging to the colleges located at these points, for which the Service is indebted to the kindness of Professor Thomas, at Columbus, Professor Anthony, at Ithaca, and Professor Wright, at New Haven. In addition, Professor Cross, at Boston, has shown great interest in the work, and has facilitated the making of observations at that point in many ways. Professor Rowland and the authorities of the Johns Hopkins University have continued to afford the excellent facilities originally provided for the observer at that point. A great deal of time was required to get these new stations in working order, but in April a series of simultaneous observations made every five minutes and extending over three days was made at all, and at the Office of the Chief Signal Officer. The results of these observations have been charted and partially studied, with interesting results.

The observers at these special stations were instructed to make frequent observations during the passage of thunder storms, and a number of interesting results of such studies have been received. Much interesting work has been done in this city by means of simultaneous observations at this office and at the Smithsonian Institution. A station has been temporarily established at the latter point through the kindness of the Secretary, Professor Spencer F. Baird, and recently an electrometer and collector have been mounted at the summit of the Washington Monument, through the courtesy of Col. T. L. Casey, Corps of Engineers, U. S. A., in charge. These local observations will be continued for some time at intervals, as the results promise to be of great value. With the receipt of the new electrometers it will be possible to equip the distant stations uniformly and to increase the number of local stations, so that far more satisfactory work will be done in the near future.

In connection with the subject of atmospheric electricity, it may be mentioned that a series of experiments are under way for the purpose of determining the proper form and dimensions of lightning-rod "grounds." This is a matter of great importance, and the results of the investigation will be of great practical value.

Ground temperatures.—The experimental study of methods of measuring ground temperatures by means of electricity has been kept up during the greater part of the year, with very satisfactory results. Two forms of electrical thermometers have been devised and tested, and they have been found to be reliable in their indications. A new form of Wheatstone's bridge has just now been constructed, which, it is believed, will render the whole apparatus complete and satisfactory. As soon as it has been tested arrangements will be made for procuring a number; the galvanometers for this purpose have already been ordered, and it is expected that during the coming year the regular observations of earth temperature may be begun at several stations. A new form of electric air thermometer of extreme sensitiveness has grown out of this investigation, and it is expected to be useful in determining certain questions.

Observations of underground water temperatures (that of water in buried mains) have been carried on through the year by Prof. E. S. Morse, of Salem, Mass., and Maj. John Gould, of Portland, Me., who kindly volunteered to do this work, and to whom the Service is indebted for a series of interesting and valuable results.

A large amount of work of a miscellaneous character has been done by the division during the year. Much of it consisted in attendance upon board meetings for the consideration of various subjects, and in the preparation of special papers and reports upon matters which were referred to the professor in charge for consideration. A good deal of miscellaneous experimental work was done in the laboratory, including important tests of cables and wires of various kinds, submitted to the Service for examination, and especially in connection with the testing before laying and testing in position of the Nantucket cable, and the examination and testing of the Block Island cable, to determine whether or not it could be repaired.

All of the work of the division has been greatly hampered and much of the time interrupted by its inconvenient and totally inadequate quarters. The rooms are often crowded with instruments to be tested or preparing for shipment, and much delicate and expensive apparatus necessary to the work of the division is continually exposed to danger and loss from breakage and other causes. That more commodious and better quarters for the division are imperatively demanded will be immediately recognized upon an inspection of those now occupied, and it is respectfully urged that it is an unwise economy on the part of the Government which allows so much valuable property to remain so poorly housed and protected.

Very respectfully,

T. C. MENDENHALL,
Professor in Charge Physical Laboratory Division.

The CHIEF SIGNAL OFFICER OF THE ARMY.

APPENDIX 23.

REPORT OF PROFESSOR WILLIAM FERREL, ASSISTANT, ON REDUCTION OF BAROMETRIC PRESSURE TO SEA-LEVEL AND STANDARD GRAVITY.

In ascending through the atmosphere the barometric pressure gradually becomes less in proportion to the mass of air left below. The weight of a column of air of any given base between the station of observation and sea-level, expressed by the height of a mercurial column of the same base at the temperature of freezing which exactly counterpoises this column of air, is *the reduction to sea-level.* But on account of the varying force of gravity between the equator and the pole the same column of mercury presses more at the same altitude in higher than in lower latitudes, and on the same parallel of latitude it presses a little more at sea-level than at some elevation above sea-level. In order, therefore, to have a definite and unvarying measure of barometric pressure it is necessary to know the height of the counterpoising mercurial column when subject to the action of some *standard force of gravity.* This is assumed to be that of sea-level on the parallel of 45°. The reduction of the height of the counterpoising barometric column to the height which it would have if subject to the force of this standard gravity, is called the *reduction to standard gravity.* Both of these reductions are included in the same formula, which is simply a reversing of the hypsometrical formula.

In this formula, strictly, the mean temperature of the air column is required, but this is generally not accurately known, and at most only that of the lower and upper stations, and then the best that can be done generally is to take the mean of the temperature at these stations, though this may differ considerably from the true mean of the whole column. But using this as the true temperature, the formula of reduction to sea-level gives the true reduction, and in this case it becomes a definite matter readily understood.

In the case in which the upper station is on a high plateau or mountain top, the question, what is the reduction to sea-level, is not so easily answered, and the matter becomes less definite. In this case there is no air column between the upper station and sea-level, and the conception of what reduction to sea-level really means is not so clear. The best that can be done is to imagine that the space between the station and sea-level is occupied by air, and that this has the same temperature as the air would have if the mountain or plateau were away. But then the question arises, what would be the temperature of this air, for we have in this case only the observed temperature of the upper station, and even this, especially when on a wide plateau or in a high mountain valley, may differ very much from what the temperature of the open air would be at that altitude if the mountain or plateau were not there. And even if this were known the law of increase down to sea-level would still be unknown. Conceiving reduction to sea-level in this case to be as stated above, it is seen that it is beset with great difficulties and uncertainties, on account of our not knowing what the temperature of the air would be under the circumstances.

For the average of the year the observed air temperature at the station may be regarded as that which the air would have if the mountain or plateau were away, but in the annual, diurnal, and abnormal changes the observed temperature of the station at the surface of the mountain top or plateau may be very different from what would be observed in the open air if this were away, especially in extreme temperatures, as those of midwinter and midsummer, or of morning and afternoon, or in the case of the maximum and minimum of the abnormal changes of short period. In such cases the extremes in open air have a much smaller range than near the earth's surface, and this is especially the case in the diurnal ranges and those of abnormal changes of short period. In the annual changes of temperature there is more time for the open air to acquire somewhat the same temperature as that of the earth's surface, but even in this case the average summer temperatures are considerably greater and the average winter temperatures considerably less on the tops of mountains, and especially on high plateaus, than in the open air on the same level at some distance away.

For all parts of the United States east of the Mississippi and Missouri rivers, with few exceptions, and the adjacent parts west of these rivers to a distance where the altitudes

become considerable, the uncertainties in the temperatures to be used have only a small effect upon the reductions, but farther west, on the high plateaus both east of the Rocky Mountains and westward to the Cascade and Sierra Nevada ranges, the effect of the uncertainty becomes great. For instance, at Cheyenne, altitude 6,105 feet, an error of 1° in the temperature argument of the tables corresponds to an error of about 0.012 of an inch, and so an error of 8°, which is often possible in individual reductions, corresponds to an error of 0.1 of an inch in the reduction.

The pressure of the atmosphere at any point does not depend merely upon the weight of the air above it, but also upon the pressure at, and consequently upon the weight of the air on all sides above, the same level. If the temperature of the air in any given locality of small extent is increased, of course the mere weight of the column of air between the upper station and sea-level is diminished, but the effect of this difference of temperature is mainly to cause and maintain an ascending current over the warmer area, with a gradually accelerated velocity in the lower part, and the reaction of this acceleration causes an increase of pressure at the earth's surface, but at or near the surface there must be a slight gradient of pressure decreasing from the surrounding parts toward the heated interior, just sufficient to keep up a flow of air to supply the ascending current. The pressure, therefore, at the base of this warmer column of air, and the difference of pressure between some upper level and sea-level, or, in other words, the reduction to sea-level, depends rather upon the weight, and consequently the temperature of the air around about the warmer column of ascending air. The case is the same where the upper station is on the top of a mountain and where the ascent of warmer air is not directly upward, but along the sides of the heated surface of the mountain. The pressure at the base and at any level up the side of the mountain depends very little upon the temperature of this warmer air, but almost entirely upon the pressures at the same levels of the air around on all sides in the vicinity of the mountain. It must be understood that we are not here considering the case in which pressure is affected by a gyratory motion of the air, but simply that in which difference of pressure depends upon difference of temperature.

In the reductions to sea-level, therefore, we need rather the general or average open-air temperature of the whole region around about than the exact local air temperature; that is, we need the temperature both at the upper and lower level, which would be given by an isothermal chart based upon observations at numerous stations around extending to no very great distance, for in such a chart local abnormal variations of temperature of small extent would not come in. With such a temperature we should obtain a reduction which would correspond very nearly with that in the case of no local disturbance of temperature, and in the case of a mountain or high plateau such a reduction as would be obtained if the mountain or plateau were away and the temperature occupying its place were used, and not the temperature of the surface of the mountain or plateau, abnormally heated above, or cooled below, that of the air generally.

For the average of the year the air temperature observed at any station on a high plateau, and especially on a mountain peak or the summit of a sharp mountain range, perhaps differs but little from that of the air generally at the same level at that altitude for some distance around, or from what would be observed at that altitude if the plateau or mountain were absent. At least, where there is so much uncertainty, the best that can be done is to use this as the temperature of the upper level. But we still need the sea-level temperature which would exist if there were no mountain or plateau. Since we have no known law or rate of increase of temperature between the two levels, especially in the case of wide plateaus, which holds universally, the best that can be done is to assume a law or rate for any given region under consideration, in reducing the observed temperatures of the stations of great elevation to sea-level, which gives a system of sea-level isotherms such as would exist if there were a sea-level plane, judging as well as possible from the position and direction of such lines determined from observations at or near sea-level around about the high stations.

Such a chart, Chart I, has been formed for the whole of the United States, including the high plateau region of the western part. The sea-level temperatures of this chart for each station, as given on the chart, were obtained by reducing the temperature above to sea-level by adding one degree for each 600 feet of altitude. This is only about one-half of the usual rate obtained in various parts of the world by comparing the temperature of high mountains with those of low-level stations, and from balloon ascents in the open air, but for the reduction of the plateau stations of the western part of the United States this rate is evidently much too great, for it throws the isotherms of this region too far north, and disturbs them very much. As the two great oceans in the higher latitudes have for the mean of the year, for well known reasons, a higher temperature than that of the continents on the same latitudes between, and the general tendency of the atmosphere is from west to east, it is evident that the isotherms in case of a low and level continent would have to descend from the western side down to lower latitudes until pretty well on into the interior of the continent, but nowhere lower than

they are in the Mississippi Valley, where they are determined from observations near sea-level. The adopted rate gives this form, as seen from Chart I, but if a greater rate were adopted it would make the isotherms curve very high up into the higher latitudes in the plateau region, and a smaller rate would cause them to run too low down in the lower latitudes. It is seen that the temperatures of the plateau region, reduced through so great an altitude, are a little irregular, as was to be expected, but in general they do not vary much from the temperatures as indicated by the sea-level isotherms.

On the eastern side of the Rocky Mountain range the temperatures seem to be a little abnormal and too great for the latitude. This is evidently the fœhn effect of the air in descending to a lower level after having passed over the high summit of the range. The stations are too few and the temperature reductions to sea-level too uncertain to determine and lay down certainly this effect, and so no attempt has been made to indicate it in the isotherms.

The reason that a lower rate of decrease of temperature with increase of altitude than usual is required in our western plateau may be due to the fact that the air passes from a warmer to a colder region in the mean of the year, in passing from west to east, and the upper currents, moving eastward faster than the lower ones, have a tendency to heat the air over the continent more above than below, and so to diminish this rate on the western side of the United States. But a less rate is undoubtedly required in all cases for high plateaus than for mountain peaks and sharp mountain ranges.

The reductions of mean annual temperature to sea-level with the assumed rate of 1° for each 600 feet having given a fairly satisfactory chart of isotherms, this rate was used in deducing the sea-level temperature to be used in the barometric formula of reduction to sea-level, and thus with the observed annual mean above, both of pressure and temperature, the reduction to sea-level was obtained in the usual way. This gives the reductions of the barometric pressures for each of the several stations in Table I, corresponding to the argument of the mean temperature of the year. The mean annual temperatures and pressures used were those deduced from all the observations made from November 1, 1879, to October 31, 1883, inclusive, including a few stations opened after November 1, 1879, and consequently having an average of less than five years. With these reductions corresponding to the mean annual temperatures, the sea-level pressures, as given on Chart IV, have been obtained, the decimal figures only being given. Over the eastern part of the United States, where the altitudes, and consequently the reductions, are small, the regularity of the pressures and of the isobars are fairly satisfactory, and the observed irregularities are no doubt due mostly to errors in the railroad levelings from which the altitudes have been obtained, but of course in some measure to instrumental and other errors. The indications are that the adopted elevations of Knoxville, Chattanooga, and a few others, perhaps all depending on the same chain of railroad levelings, are a little too great.

In the western part generally of the United States the reductions and sea-level pressures are more uncertain, both on account of the uncertainties of the altitudes and also the errors in reductions through so great altitudes. In this region the altitudes deduced from railroad levelings are few, and even these are not well ascertained. For instance, the altitude of Denver as determined from the Santa Fé and the Denver and Rio Grande Railroad, would be 78 feet higher than the adopted altitude deduced from levelings connecting it with those of the Union Pacific Railroad. The adopted value is probably the more correct one, but the difference between the two indicates that there is considerable uncertainty in either. But half or more of the altitudes through the high plateau region, marked B in Table I, have been determined barometrically merely by adopting such altitudes as would make the reduced sea-level pressures for the mean of the year harmonize best with those of the nearest stations around whose altitudes had been determined by railroad levelings. Although this smooths off the results, yet the whole system depends upon an inconsiderable number of stations with altitudes well determined. The reduction tables, therefore, for all this region must be regarded as preliminary and approximate only until there are more stations with well determined altitudes.

From an examination of Chart IV it is seen that there are two regions of high pressure, the one in the SE, near the Atlantic, and the other in Oregon and Washington Territory. The former is an extension of the permanent area of high pressure in the Atlantic Ocean about the parallel of 30° or 35°, extending to the coast and somewhat into the interior of the United States, but leveled down in the Mississippi Valley by the deflection of the westerly current of the trade wind by the Rocky Mountain range up this valley and around into the prevailing easterly current of the higher latitude. By the well-known deflection of this current to the right, depending upon the earth's rotation, there must be a gradient of decreasing pressure from the central part of high pressure in all directions, SW., W., and NW., as indicated by the chart. The high pressure in Oregon and Washington Territory no doubt arises from the obstruction of the Rocky

Mountain range to the general easterly motion of the atmosphere in those latitudes. Hence between these two high areas there is a sort of trough of lower pressure extending from the Gulf of Mexico up to the higher latitudes and connecting with the lower pressure of those latitudes prevailing generally all around the globe. Upon the whole, therefore, the tables give apparently a consistent chart of mean annual sea-level isobars, somewhat such at least as must exist, from what we know of the atmospheric currents and their consequent modification of atmospheric pressures.

The normal monthly averages of the temperature for January and July, reduced to sea level by the same law as in the case of the normal annual averages, are given in Charts II and III. Those for January are somewhat irregular for some of the higher stations, especially on the eastern side of the Rocky Mountains, where the temperatures are mostly too low to correspond with the isotherms based mostly upon observed temperatures of stations of lower altitudes. This, as in the case of the annual means, is due to the fœhn effect of the strong westerly winds of this season, dropping down to much lower levels after passing the summit of the Rocky Mountains. It is well known that all along the eastern base of this region, extending some distance eastward, there is a belt in winter of much higher temperature than that farther east on the same latitude, even at much lower altitudes. This effect even causes an inversion of the rate of decrease of temperature with increase of altitude, making it increase instead of decrease, if we compare Denver, Cheyenne, Deadwood, &c., with North Platte and other places farther east on nearly the same latitudes.

In comparing open-air observations, as those of a balloon or a mountain peak, with those of a plane near sea level, the rate of decrease of temperature with increase of altitude is found to be greater in summer than in winter, but where the upper station is on a high plateau there is probably little difference. The reductions of the normal pressures for January and July were, therefore, first computed with the monthly normals of temperature at the upper station, and with this, reduced to sea level by the same rule, as the temperature below. But in comparing the normal reduced pressures for January and July it was found that pretty uniformly all over the United States in the Mississippi and Missouri Valley, and also along the Pacific coast, and at all places where the altitudes of the stations were not very great, the difference of pressure between January and July was only about 0.15 of an inch, while for all the high plateau stations they ranged mostly from 0.3 to 0.4 of an inch. It was therefore evident that these greater differences for the high plateau stations arose from using too low temperatures in the reductions of January and too high ones in those of July, for those of the open-air temperatures, which, we have seen, are rather the ones required in reductions to sea level. In winter it is well known that the surface of the earth, whether of a high plateau or of a low plane, is lower than that of the open air at only a moderate elevation above, and that the reverse of this is true in summer. For this reason all the reduced pressures, using the observed temperatures at or near the surface, for all the high stations, were too great in January and too small in July, and hence the differences too great. It was therefore necessary to apply some corrections to the reductions for the extremes of January and July, and this correction was determined upon the principle that the differences of the reduced pressures of the high stations for January and July should not be greater, on the average, than those of the low-level stations.

Since in January the observed temperatures are too low, and in July too high, to be used as open-air temperatures, it is reasonable to assume that they differ from the open-air temperatures in proportion to the deviation of the observed temperature above or below the annual mean. The error in reduction to sea level is sensibly proportional to the error in the temperature used in computing this reduction. It is also in proportion to the altitude of the station. Hence, putting

$A =$ the departure of the temperature from the normal annual temperature,

$H =$ the altitude of the station,

$c =$ the average departure of pressure at sea level from the normal annual pressure,

$a =$ the observed departure of pressure reduced to sea level, the correction of a for error of temperature used in the reduction must be as the product of A into H, and hence we must have $a = c + C A H$, in which c and C are constants to be determined from observations of a and A at a number of high and contiguous low stations, by the method of least squares. For this purpose the values of A and a obtained from the normals of January and July can be used. The following table contains these for the principal plateau, and all the adjacent lower stations in the Mississippi and Missouri Valley and on the Pacific coast, contained in the five-year normals already referred to. With these values of A and a, and the values of H, the preceding equation gives an equation of condition for each station from which to determine, by the method of least squares, the most probable values of c and C. We thus get $c = 0.073$ and $C = 0.00105$, if we express H in thousands of feet as a unit, and hence we get $C A H = 0.00105 A H$ as the correction of the reduction to sea level for the error arising from using erroneous tempera-

tures where they differ from the annual normal, for by the principle above a differs from c only on account of errors of temperature used in the reduction, and these are supposed to vanish for the annual normal, in which case $A=o$.

TABLE.

Station.	H.	A.	a.	Res.	Station.	H.	A.	a.	Res.
	Feet.	°	*Inch.*	*Inch.*		*Feet.*	°	*Inches.*	*Inch.*
Bennett	1,510	30	0.162	+.042	Lewiston	780	22	0.070	—.021
Benton	2,660	29	.202	+.047	Little Rock	288	22	.063	—.017
Bismarck	1,694	32	.130	.000	Los Angeles	339	8	.071	—.005
Buford	1,854	30	.198	+.064	Memphis	320	20	.063	—.016
Cairo	359	22	.072	—.009	North Platte	2,841	25	.145	—.003
Cape Mendocino	637	4	.182	+.056	Omaha	1,113	27	.102	—.002
Cheyenne	6,105	21	.157	—.050	Prescott	5,389	20	.191	+.005
Concho	1,900	19	.112	+.001	Roseburg	523	13	.057	—.023
Custer	3,040	28	.148	—.008	Saint Louis	571	23	.078	—.009
Davenport	615	26	.082	—.008	Saint Paul	831	29	.085	—.012
Dayton	1,683	19	.120	+.019	Salt Lake City	4,348	23	.241	+.068
Deadwood	4,600	21	.123	—.052	Santa Fé	7,026	20	.216	—.006
Denver	5,294	22	.168	—.028	Shaw, Fort	3,530	24	.179	+.017
Des Moines	849	26	.095	—.001	Shreveport	227	18	.052	—.023
Dodge City	2,517	25	.133	—.006	San Francisco	60	30	.095	+.020
Elliott	2,700	20	.107	—.038	Sacramento	64	32	.138	+.063
El Paso	3,764	18	.140	—.003	Portland, Oreg	80	33	.024	—.051
Helena	4,069	25	.188	+.008	Spokane Falls	1,906	22	.134	+.017
Huron, Dak	1,307	30	.126	+.012	Stockton	3,010	18	.134	+.004
Keokuk	618	26	.080	—.010	Vicksburg	244	17	.050	—.027
La Crosse	725	27	.080	—.014	W. Las Animas	3,899	27	.191	+.008
Leavenworth	842	25	.090	—.005					

With the constants above the preceding equation is satisfied for each of the stations with the given residuals. It is seen that some of these are somewhat large both for the low and the high stations, amounting in a few cases to more than a half-tenth of an inch of pressure. This arises in part from errors in the principle adopted, which must be regarded as being only approximate, and in part from abnormal local differences in the values of a, which are considerable also in the nearly sea-level stations where there is little reduction to sea-level, and where consequently these differences can not be due to errors in these reductions. By the correction term in the preceding equation the reductions and the sea-level pressures are increased for temperatures above the annual normal and decreased for all temperatures below this normal, and for the plateau stations it makes the annual range of reduced pressures somewhat the same, on the average, as at the nearly sea-level stations. This correction, containing H as a factor, is of course small for most of the stations, and only becomes considerable for high stations, and especially so for those of large temperature ranges, or values of A, whether of annual or abnormal changes.

Table I contains the reductions to sea-level and standard gravity for each of the stations of the Signal Service corresponding to the approximate annual normal denoted by B_0 and given in the table. The reduction corresponding to the annual normal temperature of each station has been computed by means of the usual formula, using the annual normal temperature at the upper station, and this increased at the rate of 1° for each 600 feet of altitude for the sea-level temperature. For the reductions of diurnal averages of pressure in which the diurnal average temperature is greater or less than the annual normal, the reductions have been computed in the same manner, but afterward corrected by the term $0.00105\,AH$, as has been explained. The table is so arranged that the diurnal mean temperature of the upper station must be used as an argument, but it must be understood that the reductions are not precisely those given by the formula with this temperature above, and this increased at the adopted rate for sea-level, except for the annual normal temperature, but this reduction with the preceding correction applied.

As a correction to the reduction has to be applied for annual ranges of temperature above or below the annual mean, so in the case of the reductions of individual observations, subject to diurnal changes, a similar correction has to be applied for all temperatures above or below the diurnal mean, and the latter has to be much greater in proportion to the amount of temperature deviations from the mean, for the periods of the diurnal oscillation of temperature are much shorter, and consequently the temperature changes of the open air cannot follow those of the earth's surface nearly so closely as in case of the annual changes. The diurnal changes in the open air, in general, are perhaps not more than about one-fourth of what they are at the earth's surface. That

dirunal changes of temperature have but little real effect upon reductions to sea-level is evident from the fact that in barometric hypsometry, only very small ranges of temperature between morning and the warmest part of the day are required to obtain from observation the same altitude as when the observations are made at the mean temperature of the day.

In reductions to sea-level, also, we introduce, for high stations, a large diurnal inequality into the reduced pressures, if we use the extreme temperatures of the day in clear weather, whereas observation shows that these diurnal changes are very small at or near sea-level. As in the case of the annual, so in the diurnal ranges of the temperature; therefore, a correction must be applied for extreme temperatures, and in the latter case this has been done here approximately, in the regular tri-daily observations of the stations, by using as the temperature argument, not the observed temperature of the hour, but the mean of double the current observation of temperature, and the sum of the two preceding ones. By this arrangement only about one-fourth part of the effect of the extreme diurnal range is taken in, and this reduces the diurnal range for the high stations to about what is usually observed at and near sea-level.

Table II, with arguments B_0 and ΔB, contains the usual correction for variation of pressure at the station. This, it is seen, is small for low stations, but for high stations and unusual variations of pressure it becomes a very important correction. It has been computed from the formula—

$$\text{Correction} = \left(\frac{B_0'}{B_0} - 1\right)\Delta B$$

in which B_0', being the value of B_0 at sea-level, has been assumed for all stations to be equal to 30 inches. This, it is seen from Chart III, is very nearly the case, especially for all the high stations in the west, where alone a small error can have any sensible effect.

By means of these two tables the monthly normals for January and July have been reduced to sea-level, using the corresponding normals of temperature as arguments. The results are given in Charts V and VI. By comparing these charts it is seen that the difference of pressure between January and July is on the average and pretty uniformly, about 0.15 of an inch, whereas if the correction for the extreme temperatures of January and July had not been applied, the differences for the high stations would have been generally much more.

The expanded tables which have been furnished, one to each station, have been formed by taking the part of Table I belonging to each station and applying to it the proper correction from Table II. In this way tables were obtained, one only for each station, with the observed temperature and pressure of the station as arguments from which the proper reductions can be taken with little or no interpolation even in case of the highest stations.

Reduction of barometric pressure to sea-level and to standard gravity.

USE OF THE TABLES.

The first reduction is obtained from Table I, with one-fourth of twice the last and the two preceding tri-daily temperature observations of the station as an argument. To this add or subtract, as the case may be, the second reduction obtained from Table II, with ΔB and B_0 as arguments. This sum or difference is the complete reduction to be added to the observed pressure at the station.

If ΔB is positive; that is, if the observed barometric pressure is greater than the mean B_0 then the second reduction from Table II is additive, but otherwise it is subtractive. The values of B_0 are given in Table I, opposite the names of the stations.

REDUCTION OF BAROMETRIC PRESSURE TO SEA-LEVEL AND STANDARD GRAVITY.

TABLE I.—*Argument; the mean of twice the last and of the two preceding tri-daily temperature observations.*

Stations.	B_0.	H.	Temperature argument.											
			−20	−10	0	10	20	30	40	50	60	70	80	90
	Inches.	*Feet.*												
Abilene	28.2	1744	......	......	1.93	1.90	1.88	1.85	1.83	1.81	1.78	1.76	1.74	1.72
Albany	30.0	83	0.10	0.10	0.09	0.09	0.09	0.09	0.09	.08	0.08	0.08	0.08	0.08
Alpena	29.3	609	0.73	0.72	0.71	0.70	0.69	0.68	0.67	0.66	0.65	0.65	0.64	0.63
Apache	25.0	5020 B	......	......	5.34	5.26	5.18	5.11	5.04	4.96	4.90	4.85	4.80	4.75
Assinaboine	27.2	2690 B	3.10	3.06	3.02	2.98	2.94	2.90	2.87	2.83	2.80	2.77	2.74	2.71
Atlanta	29.0	1129	......	......	1.26	1.24	1.22	1.20	1.19	1.17	1.16	1.14	1.13	1.12
Atlantic City	30.0	13	......	......	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Augusta	29.9	183	......	......	0.18	0.18	0.18	0.17	0.17	0.17	0.16	0.16	0.16	0.15
Baltimore	30.0	45	......	......	0.04	0.04	0.04	0.04	0.03	0.03	0.03	0.03	0.03	0.03
Barnegat	30.0	22	......	......	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Behring's Island	30.0	20	0.06	0.06	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.04
Bennett	28.4	1510	1.78	1.75	1.72	1.69	1.66	1.64	1.62	1.60	1.58	1.56	1.55	1.53
Benton	27.2	2060 B	3.07	3.02	2.98	2.94	2.90	2.86	2.83	2.79	2.76	2.73	2.70	2.67
Bismarck	28.2	1094	2.00	1.97	1.94	1.91	1.89	1.86	1.84	1.82	1.80	1.78	1.76	1.74
Block Island	30.0	27	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Bidwell, Fort	25.2	4615	5.09	5.01	4.93	4.86	4.79	4.73	4.66	4.61	4.55	4.50	4.45	4.41
Boisé City	27.2	2750 B	3.14	3.10	3.05	3.00	2.96	2.92	2.89	2.85	2.82	2.79	2.76	2.73
Boston	29.9	125	0.14	0.14	0.14	0.14	0.13	0.13	0.13	0.13	0.13	0.12	0.12	0.12
Bridger, Fort	23.5	6643	7.12	7.01	6.90	6.79	6.69	6.60	6.51	6.43	6.35	6.28	6.21	6.14
Brownsville	30.0	57	......	......	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Buffalo	29.3	690	0.81	0.80	0.79	0.78	0.77	0.76	0.75	0.74	0.74	0.73	0.72	0.71
Buford	28.0	1854 B	2.19	2.16	2.13	2.10	2.07	2.04	2.02	1.99	1.96	1.94	1.92	1.90
Cairo	29.7	359	......	......	0.39	0.39	0.38	0.38	0.37	0.37	0.36	0.36	0.35	0.35
Canby, Fort	29.8	179	0.22	0.22	0.21	0.21	0.21	0.20	0.20	0.20	0.19	0.19	0.19	0.18
Cape Henry	30.0	16	......	......	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cape May	30.0	27	......	......	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Cape Mendocino	29.4	637	......	......	0.72	0.71	0.70	0.69	0.68	0.68	0.67	0.67	0.66	0.66
Cedar Keys	30.0	22	......	......	−0.02	−0.02	−0.02	−0.02	−0.02	−0.02	−0.02	−0.02	−0.02	−0.02
Charleston	30.0	52	......	......	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02
Charlotte	29.2	808	......	......	0.89	0.88	0.87	0.86	0.85	0.84	0.83	0.82	0.81	0.80
Chattanooga	29.3	783	......	......	0.87	0.86	0.84	0.83	0.82	0.81	0.80	0.79	0.78	0.77
Cheyenne	24.0	6105	6.68	6.56	6.45	6.34	6.23	6.13	6.03	5.94	5.85	5.76	5.68	5.60

REDUCTION OF BAROMETRIC PRESSURE TO SEA-LEVEL AND STANDARD GRAVITY—Continued.

Stations.	B_o.	H.	Temperature argument.											
			−20	−10	0	10	20	30	40	50	60	70	80	90
	Inches.	*Feet.*												
Chicago	29.3	661	0.78	0.77	0.76	0.74	0.73	0.72	0.71	0.71	0.70	0.69	0.69	0.68
Chincoteague	30.0	8	....	....	−0.01	−0.01	−0.01	−0.01	−0.01	−0.01	−0.01	−0.01	−0.01	−0.01
Cincinnati	29.4	628	....	....	0.71	0.70	0.69	0.68	0.67	0.66	0.65	0.65	0.64	0.63
Cleveland	29.3	690	0.81	0.80	0.79	0.78	0.77	0.76	0.75	0.74	0.73	0.72	0.71	0.71
Columbus	29.2	812	....	....	0.93	0.91	0.90	0.89	0.87	0.86	0.85	0.84	0.83	0.82
Concordia	28.6	1384	1.60	1.58	1.56	1.54	1.52	1.50	1.48	1.46	1.45	1.43	1.41	1.40
Custer	26.9	3010B	3.47	3.42	3.38	3.33	3.28	3.24	3.20	3.16	3.12	3.08	3.05	3.02
Davenport	29.4	615	0.72	0.71	0.70	0.69	0.68	0.67	0.66	0.66	0.65	0.64	0.64	0.63
Davis, Fort	25.2	4928 B	....	....	5.19	5.11	5.03	4.96	4.89	4.82	4.76	4.71	4.66	4.61
Dayton	28.2	1645 B	1.94	1.91	1.87	1.85	1.82	1.79	1.77	1.75	1.73	1.71	1.69	1.68
Deadwood	25.3	4630 B	5.16	5.08	5.00	4.92	4.84	4.76	4.69	4.62	4.55	4.49	4.43	4.38
Delaware Breakwater	30.0	20	....	....	0.01	0.01	0.01	0.01	0.01	4.01	0.01	0.01	0.01	0.01
Denver	24.7	5294	5.82	5.73	5.64	5.55	5.46	5.37	5.29	5.21	5.13	5.06	5.00	4.94
Des Moines	29.1	849	0.98	0.97	0.96	0.94	0.93	0.92	0.91	0.90	0.89	0.88	0.87	0.86
Detroit	29.3	662	0.78	0.77	0.76	0.75	0.74	0.73	0.72	0.71	0.70	0.69	0.69	0.68
Dodge City	27.4	2517	2.89	2.85	2.81	2.77	2.73	2.70	2.66	2.63	2.60	2.57	2.54	2.51
Dubuque	29.3	665	0.78	0.77	0.76	0.75	0.74	0.73	0.72	0.71	0.71	0.70	0.69	0.68
Duluth	29.3	672	0.81	0.80	0.79	0.78	0.77	0.76	0.75	0.74	0.73	0.72	0.72	0.71
Eastport	29.9	61	....	....	0.08	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.06	0.06
Elliott, Fort	27.3	2700 B	....	....	2.95	2.91	2.87	2.83	2.80	2.76	2.73	2.70	2.67	2.65
El Paso	26.4	3764B	....	....	4.05	3.98	3.93	3.87	3.82	3.77	3.72	3.68	3.64	3.60
Erie	29.3	681	0.80	0.79	0.78	0.77	0.76	0.75	0.74	0.73	0.72	0.71	0.70	0.70
Escanaba	29.3	608	0.73	0.72	0.71	0.70	0.69	0.68	0.67	0.67	0.66	0.65	0.64	0.63
Fort Smith	29.6	470	....	....	0.49	0.48	0.48	0.47	0.46	0.46	0.45	0.45	0.44	0.44
Frisco	23.7	6406 B	....	6.75	6.65	6.54	6.41	6.31	6.25	6.16	6.08	6.00	5.92	5.85
Galveston	30.0	40	....	....	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Grand Haven	29.3	620	0.73	0.72	0.71	0.70	0.69	0.68	0.67	0.67	0.66	0.65	0.65	0.64
Grant, Fort	25.2	4010 B	....	....	5.15	5.08	5.01	4.94	4.87	4.81	4.74	4.69	4.64	4.59
Greencastle	29.1	897	....	....	1.01	1.00	0.98	0.97	0.96	0.95	0.93	0.92	0.91	0.90
Hatteras	30.0	12	....	....	−0.01	−0.01	−0.01	−0.01	−0.01	−0.01	−0.01	−0.01	−0.01	−0.01
Helena, Mont	25.8	4069	4.55	4.49	4.42	4.36	4.30	4.24	4.19	4.13	4.08	4.04	4.00	3.96
Huron	28.6	1307	1.51	1.52	1.50	1.48	1.46	1.44	1.42	1.40	1.39	1.37	1.36	1.35

Indianapolis	29.2	700	....	....	0.87	0.86	0.84	0.83	0.82	0.81	0.80	0.79	0.79	0.78
Indianola	30.0	20	....	....	−0.01	−0.01	−0.01	−0.01	−0.01	−0.01	−0.01	−0.01	−0.02	−0.02
Jacksonville	30.1	43	....	....	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Keeler	26.4	3622	....	....	3.92	3.86	3.81	3.76	3.70	3.65	3.60	3.56	3.53	3.50
Keokuk	29.4	618	....	....	0.70	0.69	0.68	0.67	0.66	0.66	0.65	0.64	0.64	0.63
	30.0	20	....	....	−0.03	−0.03	−0.03	−0.03	−0.03	−0.03	−0.03	−0.03	−0.03	−0.03
	30.1	9	....	....	−0.01	−0.01	−0.01	−0.01	−0.01	−0.01	−0.01	−0.01	−0.01	−0.01
	29.1	980	....	....	1.11	1.09	1.07	1.06	1.04	1.03	1.02	1.01	1.00	0.99
La Crosse	29.2	725	0.85	0.81	0.83	0.82	0.81	0.80	0.79	0.78	0.77	0.76	0.76	0.75
Lamar, Mo.	23.9	1025	1.20	1.18	1.16	1.14	1.13	1.11	1.10	1.08	1.07	1.05	1.04	1.03
	17.7	14134	13.85	13.18	12.83	12.50	12.19	11.90	11.62	11.36	11.12	10.90	....	....
	29.2	843	0.96	0.95	0.94	0.93	0.92	0.91	0.90	0.89	0.88	0.87	0.86	0.85
	29.2	750 ft	0.88	0.87	0.86	0.85	0.84	0.83	0.82	0.81	0.80	0.79	0.78	0.77
	29.8	269	....	....	0.32	0.31	0.30	0.30	0.29	0.29	0.28	0.27	0.27	0.26
	29.6	330	....	....	0.36	0.35	0.35	0.34	0.34	0.33	0.33	0.33	0.32	0.32
Louisville	29.6	551	....	....	0.62	0.61	0.60	0.59	0.58	0.58	0.57	0.56	0.56	0.55
Lynchburg	29.4	632	....	....	0.73	0.72	0.71	0.70	0.69	0.68	0.67	0.67	0.66	0.65
Mackinaw City	29.3	605	0.73	0.72	0.71	0.70	0.69	0.68	0.67	0.66	0.65	0.65	0.64	0.63
Macon, Fort	30.1	11	..		−0.02	−0.02	−0.02	−0.02	−0.02	−0.03	−0.03	−0.02	−0.02	−0.02
Maginnis, Fort	25.6	4320 ft	4.83	4.77	4.70	4.64	4.58	4.51	4.45	4.39	4.34	4.29	4.24	4.20
Marquette	29.3	672	0.81	0.80	0.79	0.78	0.77	0.76	0.75	0.74	0.73	0.72	0.71	0.71
Memphis	29.7	320	....	...	0.34	0.34	0.33	0.33	0.32	0.32	0.31	0.31	0.31	0.30
Milwaukee	29.3	697	0.82	0.81	0.80	0.79	0.78	0.77	0.76	0.75	0.75	0.74	0.73	0.72
Mobile	30.1	35	....	....	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Montgomery	29.9	219	....	....	0.22	0.22	0.22	0.21	0.21	0.21	0.20	0.20	0.20	0.19
Montrose	24.2	5790 ft	....	6.15	6.05	5.95	5.86	5.77	5.69	5.61	5.54	5.47	5.40	5.34
Moorhead	29.0	925	1.12	1.10	1.08	1.07	1.05	1.04	1.03	1.02	1.00	0.99	0.98	0.97
Mount Washington	23.6	6279	7.00	6.92	6.75	6.59	6.43	6.27	6.12	5.97	5.82	5.68	5.54	....
Myer, Fort	29.9	267 ft	....	....	0.31	0.31	0.30	0.29	0.29	0.28	0.27	0.27	0.26	0.25
Nashville	29.5	540	....	....	0.61	0.60	0.59	0.58	0.57	0.57	0.56	0.55	0.55	0.54
New Haven	29.9	107	....	....	0.12	0.11	0.11	0.11	0.11	0.11	0.10	0.10	0.10	0.10
New London	30.0	47	....	....	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	30.0	52	....	....	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02
	29.9	168	....	....	0.19	0.18	0.18	0.18	0.17	0.17	0.17	0.16	0.16	0.16
	30.1	30	....	....	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	27.1	2841	3.23	3.19	3.14	3.10	3.06	3.02	2.98	2.94	2.90	2.87	2.84	2.81
	30.0	36	....	....	0.05	0.05	0.05	0.05	0.05	0.04	0.04	0.04	0.04	0.04
	28.9	1113	1.30	1.28	1.26	1.25	1.23	1.21	1.20	1.19	1.17	1.16	1.15	1.14
	29.7	335	....	....	0.39	0.39	0.38	0.37	0.37	0.37	0.36	0.36	0.35	0.35
	29.5	523	....	....	0.57	0.56	0.56	0.55	0.54	0.54	0.53	0.52	0.52	0.51
	30.1	30	....	....	−0.01	−0.01	−0.01	−0.01	−0.01	−0.01	−0.01	−0.01	−0.01	−0.01
	30.0	117	....	....	0.12	0.12	0.12	0.12	0.12	0.11	0.11	0.11	0.11	0.11
	29.3	766	....	....	0.87	0.86	0.85	0.84	0.83	0.82	0.81	0.80	0.79	0.78
	27.9	2000 ft	2.34	2.30	2.27	2.21	2.21	2.18	2.16	2.13	2.10	2.08	2.06	2.04
	30.0	14	....	....	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02

REDUCTION OF BAROMETRIC PRESSURE TO SEA-LEVEL AND STANDARD GRAVITY—Continued.

													80	90
													0.66	0.65
													0.10	0.10
													0.06	0.06
													5.08	5.03
													0.83	0.82
													0.19	0.19
													0.65	0.64
													0.54	0.54
													0.05	0.05
													0.58	0.57
													0.08	0.08
													0.87	0.86
													0.87	0.86
													4.22	4.17
													0.76	0.75
													0.04	0.03
													0.66	0.65
													0.02	0.02
													-0.03	-0.02
													0.04	0.04
													0.25	0.25
													6.43	6.36
													0.06	0.05
													3.51	3.46
													0.20	0.19
													1.20	1.19
													0.10	0.09
													0.01	0.01
													1.97	1.95
													0.66	0.65
													5.69	5.63
Stockton	27.0	3004 B			3.24	3.20	3.16	3.11	3.07	3.03	2.99	2.96	2.93	2.90
Sully, Fort	28.8	1600 B	1.89	1.85	1.84	1.80	1.70	1.75	1.73	1.71	1.69	1.67	1.65	1.64
Tatoosh Island	29.9	80			0.11	0.11	0.11	0.10	0.10	0.10	0.10	0.10	0.09	0.09
Thomas, Fort	27.3	2710 B			2.95	2.91	2.87	2.83	2.80	2.76	2.72	2.69	2.66	2.64

Toledo	29.3	601	....	....	0.74	0.73	0.72	0.71	0.70	0.70	0.69	0.68	0.68	0.67
Totten, Fort	28.4	1487	1.78	1.76	1.74	1.71	1.69	1.67	1.65	1.63	1.61	1.60	1.58	1.56
Unalashka	29.8	13	....	....	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Valentine	27.3	2603	2.97	2.93	2.89	2.85	2.81	2.77	2.74	2.70	2.67	2.64	2.61	2.58
Vicksburg	29.8	222	....	....	0.23	0.23	0.22	0.22	0.21	0.21	0.21	0.20	0.20	0.19
Washington	30.0	106	....	....	0.11	0.11	0.11	0.10	0.10	0.10	0.10	0.10	0.09	0.09
West Las Animas	26.0	3899	....	....	4.21	4.15	4.09	4.03	3.98	3.92	3.87	3.82	3.78	3.75
Wilmington	30.0	52	....	....	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Winnemucca	25.6	4358	4.80	4.73	4.67	4.61	4.54	4.48	4.42	4.36	4.31	4.26	4.21	4.17
Yankton	28.7	1228	1.44	1.42	1.40	1.38	1.36	1.35	1.33	1.31	1.30	1.29	1.27	1.26
Yuma	29.8	141	....	....	0.13	0.13	0.13	0.12	0.12	0.12	0.12	0.11	0.11	0.11

REDUCTION OF BAROMETRIC PRESSURE TO SEA-LEVEL AND STANDARD GRAVITY.

TABLE II.—*Arguments; B_0 and AB, in which B_0 is the approximate mean pressure at the station, and $AB = B - B_0$ is the difference between this mean and the observed pressure.**

AB.	Mean barometric pressure of the station B_0 in inches.													
in.	29.5	29.0	28.5	28.0	27.5	27.0	26.5	26.0	25.5	25.0	24.5	24.0	23.5	*Pike's Peak.* 17.7
± 0.05	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.03
.10	.00	.00	.00	.01	.01	.01	.01	.01	.02	.02	.02	.02	.03	.07
.15	.00	.00	.01	.01	.01	.02	.02	.02	.03	.03	.03	.04	.04	.10
.20	.00	.01	.01	.01	.02	.02	.03	.03	.03	.04	.04	.05	.05	.14
.25	.00	.01	.01	.02	.02	.03	.03	.04	.04	.05	.05	.06	.07	.17
.30	.01	.01	.02	.02	.03	.03	.04	.05	.05	.06	.07	.07	.08	.21
.35	.01	.01	.02	.02	.03	.04	.05	.05	.06	.07	.08	.09	.10	.24
.40	.01	.01	.02	.03	.04	.04	.05	.06	.07	.08	.09	.10	.11	.28
.45	.01	.02	.02	.03	.04	.05	.06	.07	.08	.09	.10	.11	.12	.31
.50	.01	.02	.03	.03	.04	.05	.07	.08	.09	.10	.11	.12	.14	.35
.55	.01	.02	.03	.04	.05	.06	.07	.08	.10	.11	.12	.14	.15	.38
.60	.01	.02	.03	.04	.05	.07	.08	.09	.11	.12	.13	.15	.17	.42
.65	.01	.02	.03	.05	.06	.07	.09	.10	.11	.13	.15	.16	.18	.45
.70	.01	.02	.04	.05	.06	.08	.09	.11	.12	.14	.16	.17	.19	.49
.75	.01	.03	.04	.05	.07	.08	.10	.11	.13	.15	.17	.19	.21	.52
.80	.01	.03	.04	.06	.07	.09	.11	.12	.14	.16	.18	.20	.22	.56
.85	.01	.03	.04	.06	.08	.09	.11	.13	.15	.17	.19	.21	.23	.59
.90	.02	.03	.05	.06	.08	.10	.12	.14	.16	.18	.20	.22	.25	.63
.95	.02	.03	.05	.07	.09	.10	.13	.15	.17	.19	.21	.24	.26	.66
1.00	0.02	.04	0.05	0.07	0.09	0.11	0.13	0.15	0.18	0.20	0.22	0.25	.27	0.70

* Barometer reading corrected for temperature and instrumental error, but not reduced to standard gravity.

YEAR

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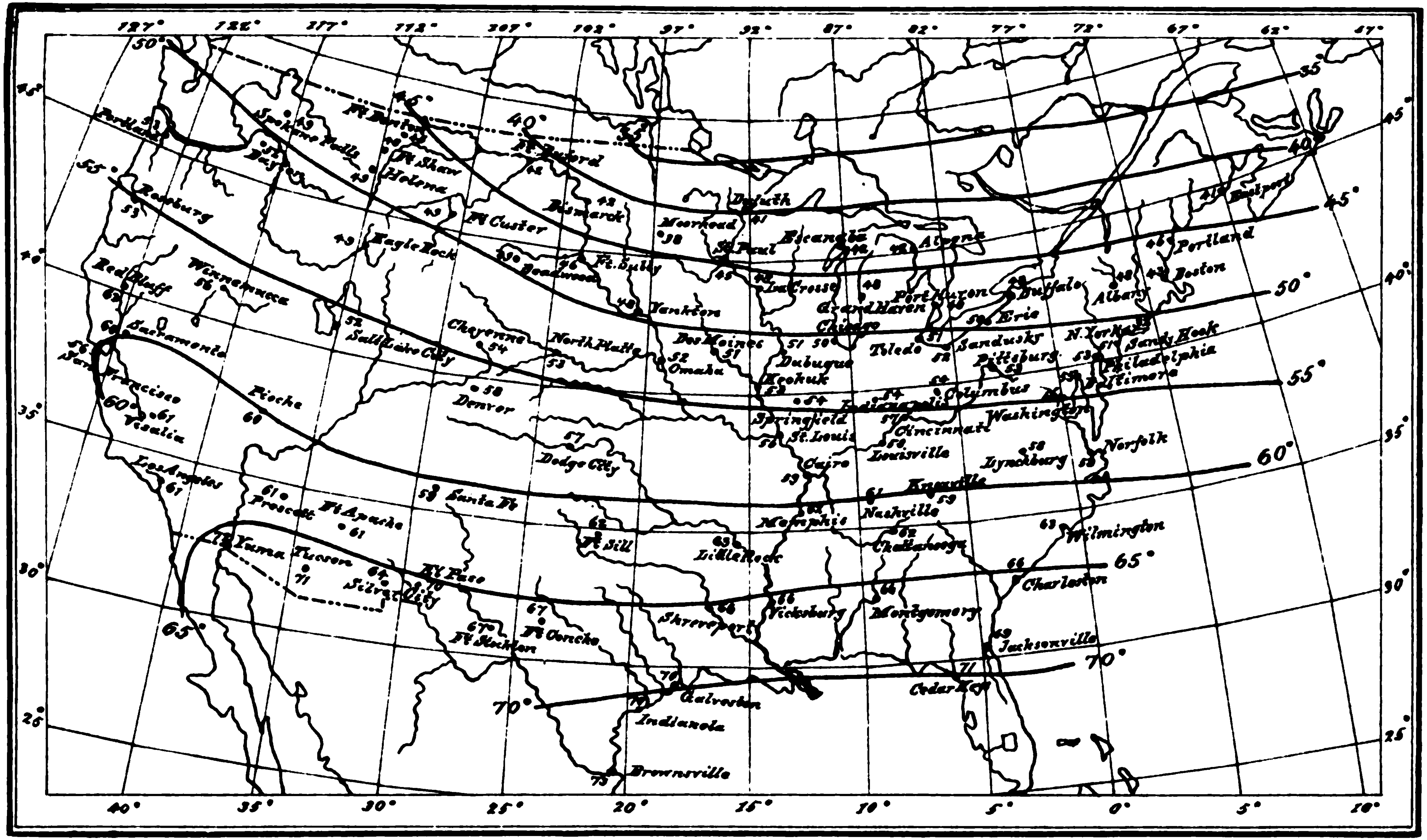

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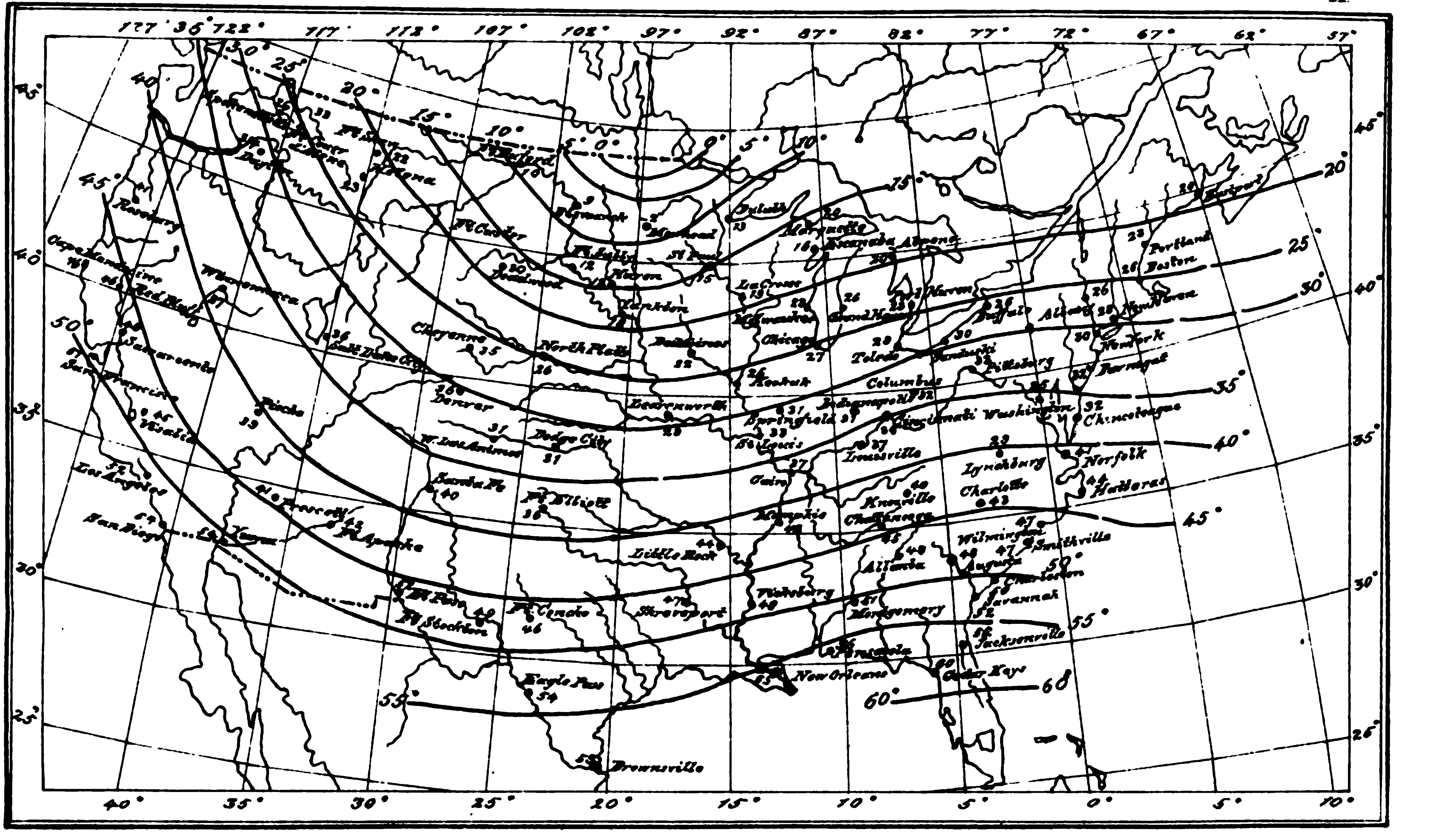
II.



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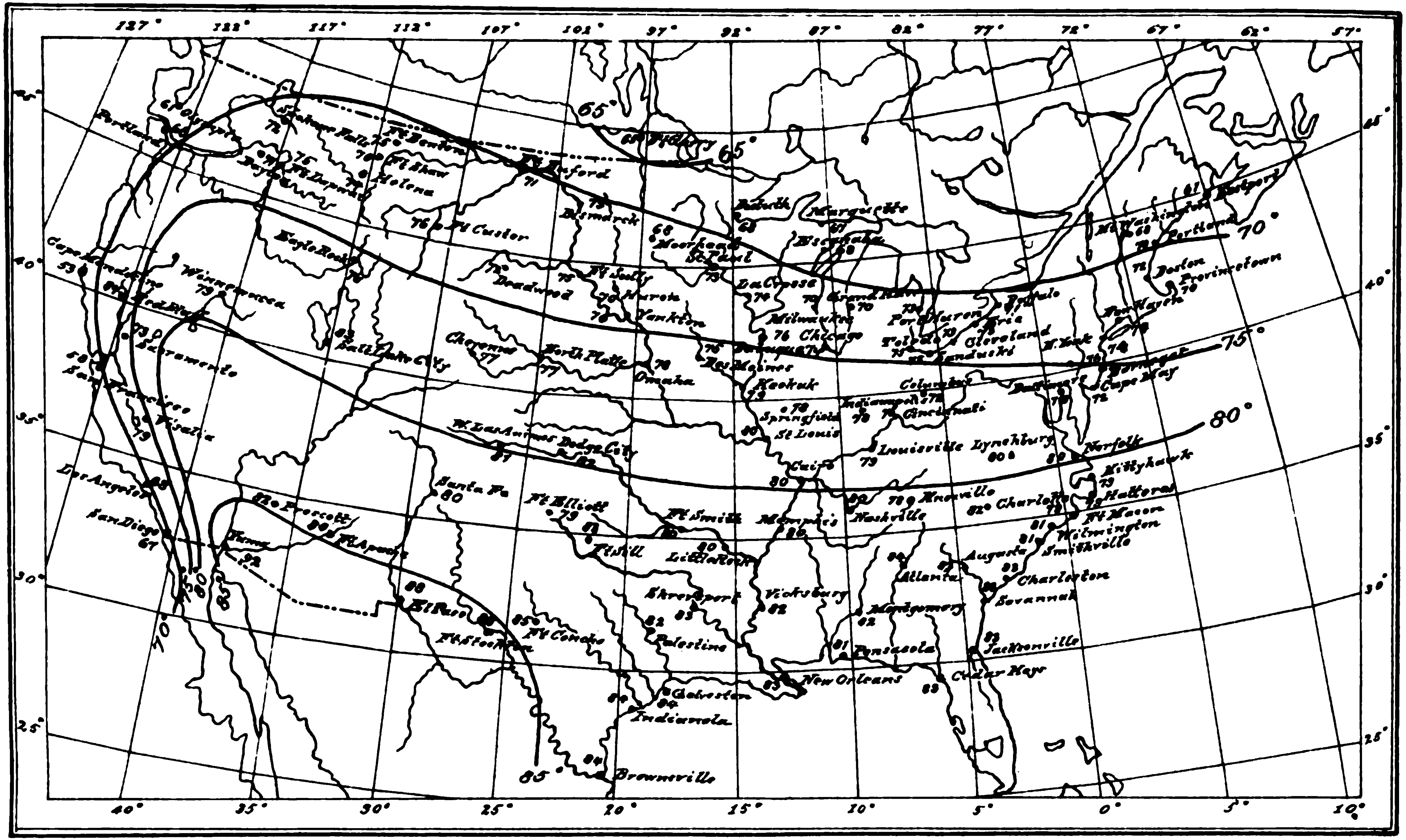

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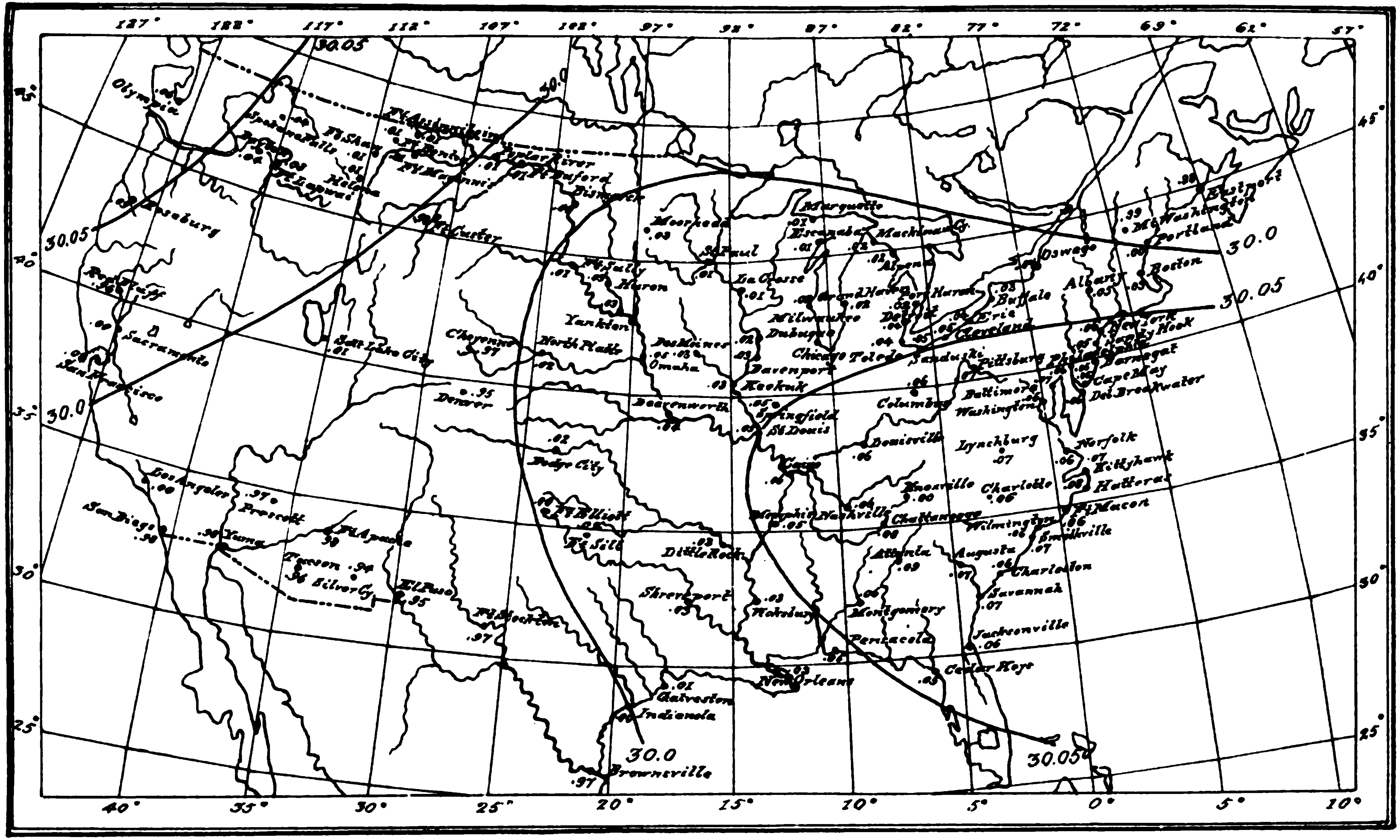
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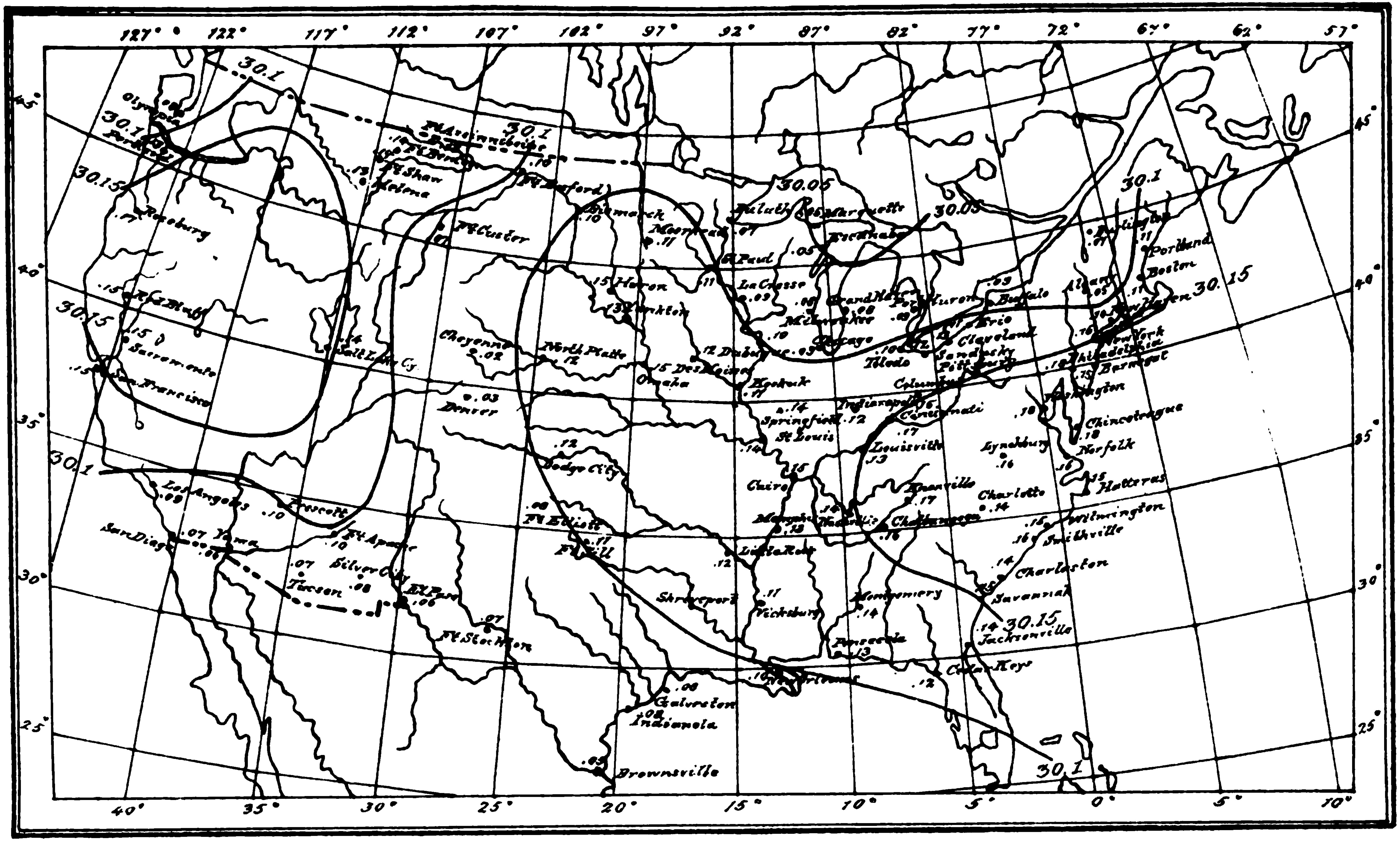
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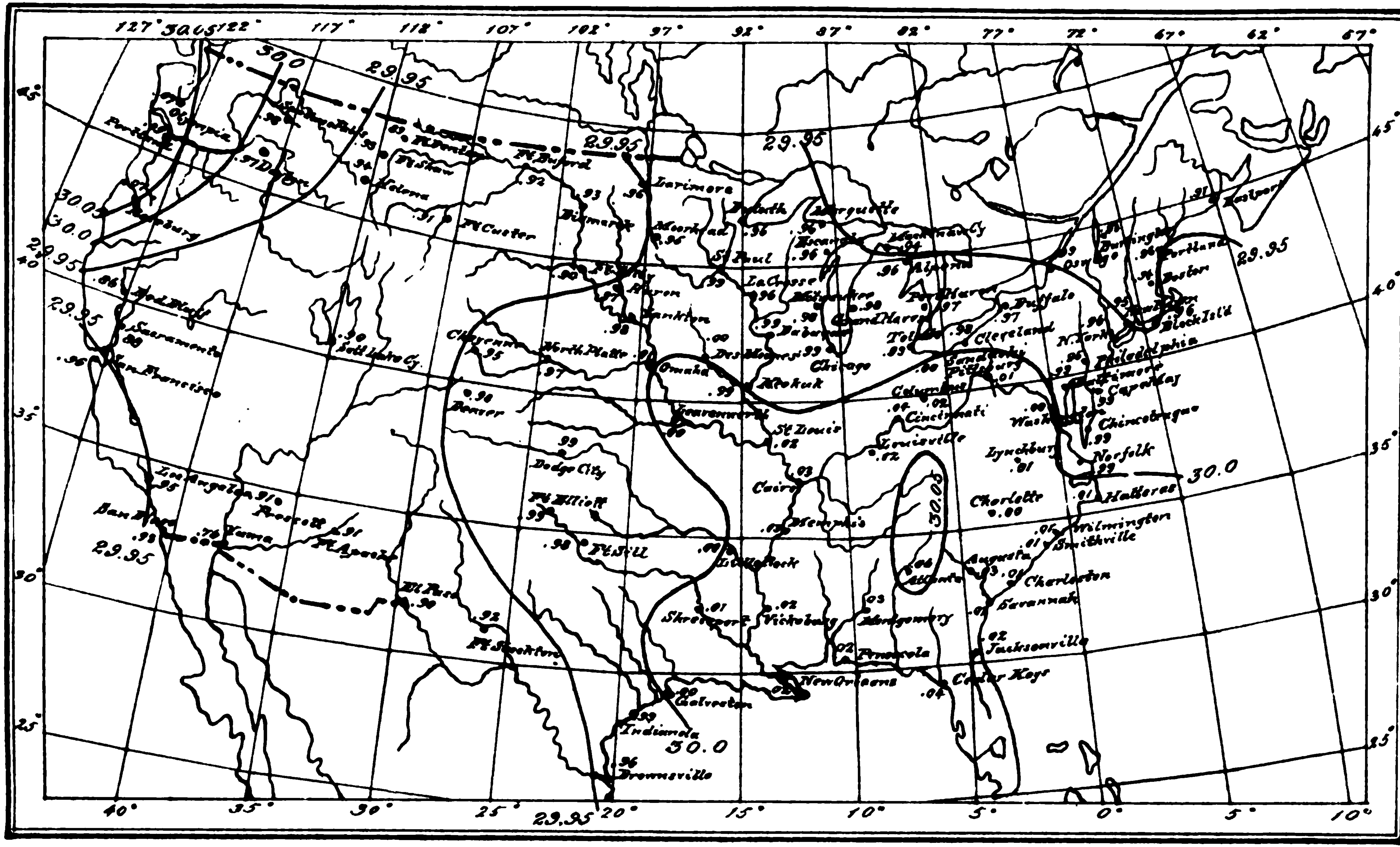
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Sacramento
San Francisco
Los Angeles
San Diego
Yuma
Prescott
Ft. Apache
El Paso
Ft. Stockton
Salt Lake Cy.
Helena
Ft. Custer
Ft. Buford
Bismarck
Moorhead
Larimore
Duluth
Marquette
St. Paul
La Crosse
Cheyenne
North Platte
Denver
Omaha
Des Moines
Keokuk
Chicago
Dubuque
Grand Haven
Alpena
Port Huron
Toledo
Cleveland
Buffalo
Oswego
Burlington
Portland
Boston
Eastport
Block Isl'd
N. York
Philadelphia
Baltimore
Cape May
Chincoteague
Washington
Norfolk
Lynchburg
Charlotte
Hatteras
Wilmington
Smithville
Charleston
Savannah
Augusta
Atlanta
Jacksonville
Cedar Keys
Pensacola
Montgomery
New Orleans
Vicksburg
Shreveport
Little Rock
Memphis
Cairo
St. Louis
Louisville
Cincinnati
Columbus
Pittsburg
Leavenworth
Dodge City
Ft. Elliott
Ft. Sill
Galveston
Indianola
Brownsville
Yankton
Huron
127° 122° 117° 112° 107° 102° 97° 92° 87° 82° 77° 72° 67° 62° 57°
45° 40° 35° 30° 25°
40° 35° 30° 25° 20° 15° 10° 5° 0° 5° 10°

APPENDIX 24.

REPORT OF PROFESSOR WILLIAM FERREL, ASSISTANT, ON PSYCHROMETRIC TABLES FOR USE IN THE SIGNAL SERVICE.

SIGNAL SERVICE OFFICE,
Washington, December 10, 1885.

SIR: I have the honor to transmit herewith a report upon the work assigned me of adapting the psychrometric formula to the whirled psychrometer and of preparing psychrometric tables based upon it for the use of the Signal Service. To this end I was instructed to use the experiments made in Colorado by Junior Professor Marvin especially for this purpose, and also to discuss, and utilize as far as possible, observations made elsewhere. In the determination of the constant in the new adaptation of the formula only such experiments could be used to advantage as had been made in accordance with the proposed new manner of using the psychrometer; and the unexpectedly large number of experiments in Colorado on account of delays in ascending to Pike's Peak rendered it entirely unnecessary to seek others, except for the sake of having a greater weight of experiments at and near sea-level, where psychrometric tables are mostly used. In addition, therefore, to the comparative simultaneous experiments made at Washington by Professors Marvin and Hazen, after the return of the former from Colorado, those which had been previously made by the latter in Massachusetts and Washington with a whirled psychrometer have likewise been used.

A partial discussion was made of the experiments made by Pvt. Delano at Yuma, and Sergeant Leitzell at Colorado Springs and Pike's Peak, in 1883, with little or no special ventilation, but the results, as usual where there is but little ventilation, were so discordant, and so different from those obtained from the experiments with the whirled psychrometer, that they were judged to have no weight in comparison with that of the very satisfactory results obtained throughout from the experiments with the whirled psychrometer.

I am, very respectfully, yours,

WILLIAM FERREL,
Professor and Assistant.

The CHIEF SIGNAL OFFICER OF THE ARMY.

REPORT ON VAPOR TENSION, DEW-POINT, AND RELATIVE HUMIDITY TABLES.

1. The psychrometric formula, which is required to be reduced to tables, may be expressed in the following general form:

$$p=p_1-A\,P(\tau-\tau_1) \qquad (1)$$

in which—

τ = the air temperature;
τ_1 = the temperature of the wet-bulb thermometer;
p = the tension of aqueous vapor in the air;
p_1 = the tension of saturation at temperature τ_1;
P = the barometric pressure;
A = a function which is a constant, independent of the vapor tension, only under certain fixed conditions.

This formula has been deduced by both Maxwell * and Stefan † upon the principles of the interdiffusion of gases, and has been further considered theoretically by the present writer, ‡ to which treatises reference must be made for the theory of the formula, since it is not convenient to introduce any theoretical researches here.

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* Encyclopedia Britannica, ninth edition, article Diffusion.
† Teit. der Oest. Gesell. für Meteorologie, XVI, p. 177.
‡ Recent Advancements in Meteorology.

The value of A above, except so far as it depends in a very small measure upon τ_1, has usually been regarded as a constant under all conditions of ventilation, size, and shape of the wet bulb, thickness of stem, &c. In order for this to be the case, it would be necessary for $\tau-\tau_1$, the amount of cooling of the wet bulb by evaporation, to be the same under all these conditions; but it has been long known, and can be readily shown by the most casual and crude experiments, that this is not so.

More than a half century ago Belli,* a distinguished Italian physicist, showed by experiment that the amount of cooling of the wet-bulb thermometer by evaporation depends both upon the amount of agitation of the air and upon the size and shape of the bulb. His experiments showed that in passing from tranquil air to that having a motion of a few meters per second, there was a considerable depression of the temperature of the wet bulb, and that in the passage from tranquil air to that having a velocity of one meter per second the effect was very much more than in the passage from air with a velocity of one meter per second to that with a velocity of three meters per second, and that with an increase of velocity beyond three meters per second there was scarcely any further depression of the temperature. He also found that the smaller the bulb, whatever its shape, the greater was the depression of temperature for any given velocity of ventilation, but that the differences of temperature depending upon size and shape gradually diminished with increase of ventilation, and vanished with that velocity which gives sensibly the maximum depression of temperature.

(2.) Since the value of $\tau-\tau_1$ therefore depends upon both the size and shape of the bulb and the amount of agitation of the air, it was evident that the indications of the psychrometer under all conditions could not be used for determining from the psychrometric formula the hygrometric state of the air, unless they were always taken with some given size and shape of bulb and velocity of ventilation, or else with that velocity of ventilation which gives the maximum depression of temperature of the wet bulb, in which case the differences depending upon size and shape vanish. Belli, therefore, recommended the use of a ventilated psychrometer, and he was the first to do so, and he also devised an apparatus by which a current of air could be drawn through a tube, first over the dry, and then over the wet bulb by means of the reverse action of a bellows.

It is well known that Espy, also, in his psychrometric observations, always used a sling psychrometer. His language is: "When experimenting to ascertain the dew-point by means of the wet bulb I always swung both thermometers moderately in the air, having first ascertained that a moderate movement produced the same depression as a rapid one." From the indications obtained in this manner he obtained, by means of an empiric formula devised for the purpose, the hygrometric state of the air. Although his formula was imperfect, and not applicable with much accuracy to either extreme of temperature, yet for a large range of medium temperatures it gave, in general, much better results than Regnault's formula, with the value of A usually adopted, where the psychrometer is not used under the conditions of velocity of ventilation, size and shape of the bulb, &c., to which the value of the constant is adapted, but under any conditions existing at the time.

(3) Although so long a time has now elapsed since these initial attempts to introduce the use of the whirled or ventilated psychrometer, yet meteorologists of the present time are just beginning to see the importance of adopting the principles and methods of these two distinguished pioneers in true psychrometry. This arises from the fact that recently many comparisons of results given by the ventilated or whirled psychometer with those given by the ordinary use of the psychrometer, and also of those given by the latter with the indications of the condensing and other hygrometers, have been made, and the great differences noted. From these it is evident that the psychrometer, as it has been used, is very imperfect, so much so that Dr. Assman, of Magdeburg, Germany, has recently stated, and justly, that "it is the most uncertain of all meterological instruments."

This is fully confirmed by a comparison of vapor tensions given by the psychrometer and condensing hygrometer in experiments recently made in connection with the Signal Service. The following table contains the vapor tensions obtained by Langley † at Lone Pine Station, Arizona, in his Mount Whitney expedition, with the psychrometer and Guyot's Tables and Regnault's condensing hygrometer:

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*Corso elementare di Fisica Sperimentale di Giuseppe Belli, Professor di Fisica nell, I. R. Liceo di Porte Nuovo in Milano, 1830.

† Mount Whitney expedition.

Date.	Local time.	Wind.	Force of vapor.	
			Psychrometer.	Hygrometer.
	h. m.		mm.	
August 8.	8 15 a. m.	Gentle.	16.18	9.72
August 8.	8 15 p. m.	Fresh.	10.89	8.87
August 9.	8 15 a. m.	Calm.	16.65	11.70
August 10.	8 15 p. m.	Fresh.	10.08	8.87
August 11.	8 15 a. m.	Gentle.	11.61	7.08
August 11.	8 15 p. m.	Fresh.	6.52	5.84
August 12.	8 15 a. m.	Gentle.	12.20	7.39
August 12.	8 15 p. m.	Fresh.	12.10	8.23
August 13.	8 15 a. m.	Gentle.	13.00	7.49
August 14.	8 15 a. m.	Calm.	9.98	8.08
August 14.	8 15 p. m.	Variable.	5.04	5.51
Mean			11.30	8.07

In every case except one the psychrometer gave a vapor tension too great, and on the average it gave one which is nearly one-half too great.

The following is a comparison of vapor tensions given by the psychrometer with Guyot's tables and Alluard's condensing hygrometer, in the experiments made by Private Stuart M. Leitzell, of the Signal Service, at Colorado Springs, during the latter part of August, in the series made alternately at Colorado Springs and on Pike's Peak during the year 1883. Also in the case of similar experiments made by W. S. Delano at Yuma, Ariz., during the same year:

Leitzell.				Delano.			
Date.	Vapor tensions.			Date.	Vapor tensions.		
	Psychrometer.	Hygrometer.	P—H.		Psychrometer.	Hygrometer.	P—H.
	mm.	mm.	mm.		mm.	mm.	mm.
Aug. 19	8.07	6.20	1.87	Sept. 25	7.77	7.78	—0.01
	8.49	6.97	1.52		10.03	8.96	+1.07
20	9.55	6.97	2.58	26	6.31	5.50	+0.81
	9.08	5.58	3.50		8.23	5.12	+3.11
21	8.62	5.46	3.16	27	7.83	6.74	+1.09
	7.51	4.41	3.10		9.06	4.91	+4.15
22	8.34	6.69	1.65	28	11.67	11.58	+0.09
	9.10	7.42	1.68		6.00	4.74	+1.26
23	8.63	7.36	1.27	29	10.71	9.64	+1.07
	9.12	6.37	2.75		7.95	6.69	+1.26
24	11.62	10.16	1.46	30	12.94	12.12	+0.82
	10.83	7.12	3.71		13.17	12.12	+1.05
25	8.44	6.92	1.52	Oct. 1	9.42	8.78	+0.64
	9.31	7.42	1.89		9.20	8.05	+1.15
26	11.18	11.14	0.04	2	8.12	6.64	+1.48
	12.43	11.43	1.00		7.14	5.66	+1.48
27	12.86	10.85	2.01	3	5.96	5.86	+0.10
	8.65	6.83	2.82		4.54	4.41	+0.13
28	12.41	10.92	1.49	4	9.86	10.16	—0.30
	11.44	8.66	2.78		11.30	9.20	+2.10
29	10.63	7.36	3.27	5	5.02	4.67	+0.35
	8.50	5.46	3.04		2.69	3.28	—0.59
30	10.71	8.05	2.63	6	4.33	4.80	—0.47
	11.17	7.17	4.00		3.86	4.31	—0.45
31	10.34	7.31	3.03	7	7.24	7.26	—0.02
	7.96	4.16	3.80		5.48	6.24	—0.76
Means	9.80	7.45	2.35	Means	7.92	7.12	+0.80

In the case of Leitzell's experiments the psychrometer again, with Guyot's tables, gives a vapor tension too large in every case, and in the average of the twenty-six experiments, one which is about one-third too large. In Delano's experiments the differ-

ences in individual cases are often quite large, but in the average the difference is very much smaller.

(4) It is not to be supposed that these large differences in the preceding comparisons are due to inaccuracies in the experiments. They arise simply from the use of the psychrometer under conditions to which the constant in Regnault's formula and Guyot's tables based upon it are not applicable, for to obtain true results in the ordinary use of the psychrometer it would be necessary to have a different constant in the formula and a different set of tables for every change of breeze.

In the case of Langley's experiments there seems to have been but little wind, perhaps nearly a calm, where the thermometers were exposed. Leitzell and Delano were instructed to fan the thermometers when the velocity of the wind was less than 10 miles per hour. The fanning of the former does not seem to have had much effect, since there is generally not much difference in the depression of the wet-bulb when fanned and unfanned, the readings for both being given. Hence the differences between the psychrometer and hygrometer are large, nearly as much so as in the case of Langley's unfanned psychrometer. Delano seems to have fanned more effectually, as appears in the greater differences between the readings of the wet-bulb thermometer when fanned and when not fanned; and hence there is, in general, a better agreement of his psychrometer with the hygrometer. If the thermometer had not been fanned at all the differences in the preceding table between the psychrometer and nygrometer would, in general, have been considerably greater. It is safe to state, therefore, that vapor tensions, as usually obtained with the psychrometer in close shelters without special ventilation, are, on the average, at least one-third too great.

(5) That the same constant in the psychrometric formula and the same tables cannot be used with the psychrometer under all conditions is well shown by the recent very important researches on this subject by Sworykin, of St. Petersburg, Russia. Putting the formula into the form of the preceding equation (1), he has shown by careful experiments that the values of A required to satisfy the equation when the psychrometer is used with different velocities of ventilation and with two different kinds of thermometer bulbs, are as given in the following table, in which the numerical values of A are read from curves in the graphic representation of his results:

Velocity of ventilation in meters per second.	Values of A for a psychrometer.	
	With spherical bulbs 10 mm in diameter.	With cylindrical bulbs 8 mm in length and 4 mm in diameter.
0.2	0.001120	0.000900
0.4	920	775
0.6	845	730
0.8	800	710
1.0	774	697
2.0	712	670
3.0	687	660
4.0	673	655
5.0	664	652
6.0	656	650

From these results it is seen that the value of A is large for a small velocity of ventilation, and that there is a very great change in its value, while large, with a small change of velocity of ventilation, the change in passing from almost a calm to a velocity of one meter per second being very much greater than that in passing from a velocity of one meter per second to one of three meters per second. From an inspection of the formula it is seen that a large decrease in the value of A must correspond with a large increase in the value of $\tau-\tau_1$, that is, in the depression of the wet-bulb temperature. Hence the experiments of Belli and of Espy, who found that the amount of depression of the wet bulb at first increased very rapidly with increase of velocity of ventilation, but that there was but little increase after a velocity of three meters per second had been attained, are confirmed by these of Sworykin, in which the value of A changes rapidly at first with increase of ventilation, but after a velocity of three or four meters there is but little further change in its value.

Belli also found that the depression of the wet-bulb temperature for the same velocity of ventilation, when small, was greater for small than for large thermometer bulbs, and in accordance with this, Sworykin likewise finds a smaller value of A for a small cylin-

drical bulb than for a larger spherical one. The former also found that with a velocity of three meters per second there was no sensible difference between the temperature depressions of large and small bulbs, and so in the preceding tabular values of A it is seen that there is likewise little difference in the values required, with velocities greater than three meters per second.

No one familiar with the subject can merely glance at the results in the preceding table of Sworykin's results without seeing the futility of attempting to use the same tables either with the same psychrometer used with different velocities of ventilation, or psychrometers with thermometer bulbs of different sizes and shapes, used with the same velocity of ventilation, unless this velocity in both cases is at least three meters per second; and it is from these, perhaps, more than from any others, that meteorologists are now beginning to see the necessity of adopting the sling or whirled psychrometer.

With any given shape and size of thermometer bulb, largeness of stem, and velocity of ventilation, a constant in the psychrometer formula would be determined and tables constructed to correspond, but it is seen that, unless the velocity is large this would always require the same kind of bulb and the same velocity, and the latter to be accurately measured. But by using a large velocity of ventilation, three meters or more per second, the same tables can be adapted to any kind of a thermometer and to all changes of velocity above that which gives sensibly the greatest depression of the wet-bulb temperature; and with this arrangement there is no necessity to measure or estimate the velocity in each case, but we have only to be certain that it does not fall below a given limit.

(6) From what precedes, therefore, it would seem that the determination to introduce into the Signal Service the use of the whirled psychrometer and to have it whirled with a velocity of three or more meters per second and to prepare tables adapted to such a use of it is a wise one. The preparation of such tables required the previous determination of the constant A in the psychrometric formula adapted to the new method of using the psychrometer, and this, of course, could only be determined from experiments made with the psychrometer used in this manner.

Few experiments had ever been made, and none at very high altitudes, to determine whether the same value of the constant A, in the ordinary use of the psychrometer, held at all altitudes; and these, it is well known, have given unsatisfactory results. It was, therefore, very properly decided to have the experiments for this new determination of the constant made at several very different altitudes, ranging from sea-level up to the top of Pike's Peak.

From the simultaneous experiments made by Junior Professor Marvin with a sling psychrometer and Regnault's hygrometer, from the latter part of March to the first part of August, 1885, in Colorado, at Colorado Springs, near the base of Pike's Peak; at the Trail House, on the trail up the mountain to the Peak, and on the Peak; and also from experiments made by Professors Marvin and Hazen in Washington, and by the latter in Massachusetts, the value of the constant A has been determined in the manner now to be described.

(7) In the first columns of the following table are given, in international measures, the temperatures τ of the dry bulb and τ_1 of the wet bulb of the sling psychrometer, and the dew-point δ observed with Regnault's hygrometer. Each of these temperatures is the average of ten readings of the thermometers taken alternately back and forth within a short time in such a manner as to make the averages equivalent to those of simultaneous readings. It is seen from the first column that a few of the experiments have been rejected. This, however, has not been done in any case where there was not some marginal note given by the experimenter to indicate that the experiment was not satisfactory.

COLORADO SPRINGS—(First Series.)

	°	°	°	mm.	mm.	mm.		°	°	°	mm.	mm.	mm.
6	11.78	4.47	−2.56	2.62	2.81	+0.21	86	17.78	[illegible]	−4.28	[illegible]	3.87	−0.04
7	12.46	4.42	−6.46	2.59	2.97	−.14	87	14.80	[illegible]	−2.17	3.90	4.04	−.14
8	13.40	4.94	−6.66	2.81	2.04	−.23	88	[illegible]	7.70	−2.38	3.87	3.72	+.15
9	13.15	4.86	−6.70	2.75	2.63	+.15	89	17.44	7.07	−3.49	3.64	3.28	+.36
10	15.00	5.66	−5.69	3.02	2.99	+.08	90	19.42	7.40	−4.07	2.91	2.77	+.14
11	13.09	4.70	−5.78	2.97	[illegible]	+.02	91	18.74	6.95	−7.28	2.66	[illegible]	+.04
12	11.30	2.62	−6.37	3.07	3.17	−.10	92	[illegible]	[illegible]	−7.29	2.66	2.55	+.11
13	15.17	6.78	−2.69	2.45	2.94	−.49	93	[illegible]	6.82	−7.30	2.65	2.70	−.05
14	13.92	5.00	−6.41	2.84	[illegible]	−.04	94	[illegible]	6.63	−6.66	2.79	[illegible]	+.10
15	15.34	6.66	−5.77	2.98	2.76	+.22	95	14.80	6.41	−6.42	2.84	2.82	+.02
16	12.73	4.36	−6.42	2.84	2.81	+.08	96	16.44	6.44	−6.44	2.83	2.64	+.19
17	11.10	3.89	−4.36	3.31	[illegible]	+.21	97	22.04	8.91	−6.39	3.07	3.18	−.06
18	9.47	2.95	−3.97	3.60	[illegible]	−.22	98	22.64	[illegible]	−5.68	3.00	[illegible]	+.05
19	9.01	3.77	−3.14	3.63	3.84	−.21	99	22.70	8.86	−5.72	2.99	2.84	+.15
20	9.27	4.08	−2.83	3.85	3.95	−.10	100	[illegible]	8.30	−5.66	3.00	2.77	+.23
21	8.86	4.22	−0.96	4.36	[illegible]	−.02	101	24.96	9.64	−4.78	2.76	2.85	−.09
22	7.27	3.76	−0.66	4.29	4.54	−.25	102	[illegible]	1.69	−4.72	3.23	3.26	−.03
23	7.31	3.43	−0.74	4.32	4.24	+.08	103	6.46	1.71	−4.79	3.21	3.24	−.03
24	2.54	1.11	−0.92	4.27	4.38	−.11	104	6.54	1.72	−4.59	3.26	3.22	+.04
25	3.74	1.79	−0.61	4.37	4.39	−.02	105	6.67	1.83	−4.42	3.30	[illegible]	+.04
26	3.60	0.64	−3.44	3.55	3.51	+.04	109	11.74	6.01	1.93	5.25	5.19	+.06
27	4.30	0.89	−4.08	3.39	3.41	−.02	110	12.42	6.30	2.04	5.28	5.09	+.19
28	5.53	1.21	−5.43	3.06	3.24	−.18	114	11.11	5.22	−0.06	4.35	4.20	+.15
29	4.64	0.53	−5.47	3.05	3.01	+.04	115	11.11	5.30	−0.33	4.40	4.29	+.18
30	4.66	0.20	−5.53	3.03	2.85	+.18	116	10.56	5.45	0.33	4.68	4.63	+.05
31	0.94	−1.66	−4.82	3.20	2.98	+.22	117	10.29	5.23	0.39	4.70	4.54	+.16
32	0.46	−1.26	−4.53	3.27	3.40	−.13	118	10.56	5.63	0.46	4.72	4.81	−.09
33	0.60	−1.80	−5.78	2.98	3.08	−.10	119	11.08	5.60	0.06	4.55	4.47	+.08
34	−3.24	−4.11	−6.66	2.81	3.02	−.21	120	6.20	1.18	−4.28	3.34	3.30	+.04
35	13.60	4.48	−9.63	2.21	2.43	−.22	121	16.20	7.30	−4.44	3.30	3.17	+.13
36	20.00	5.89	−17.44	1.17	1.15	+.02	122	18.14	6.73	−5.75	[illegible]	2.72	+.27
37	18.91	6.47	−17.44	1.17	1.23	−.06	123	18.58	6.06	−6.04	2.91	2.71	+.20
38	17.21	4.55	−16.95	1.22	1.12	+.10	124	19.06	7.22	−6.72	2.77	2.73	+.03
39	13.84	3.83	−17.40	1.18	1.10	+.08	[illegible]	17.60	6.34	−7.60	2.55	2.42	+.13
40	19.83	6.34	−10.16	2.18	[illegible]	+.80	126	18.89	7.32	−5.80	2.98	2.91	+.07
41	20.96	7.20	−10.50	2.07	1.94	+.13	127	19.08	[illegible]	−5.77	2.98	2.88	+.10
42	18.65	5.91	−11.40	1.93	1.72	+.21	128	19.20	7.29	−6.07	2.91	2.76	+.15
43	18.28	5.61	−11.72	1.85	1.61	+.24	129	19.48	7.88	−6.15	2.89	2.70	+.19
44	17.73	5.47	−11.61	1.90	1.72	+.18	130	20.28	8.44	−2.78	3.46	3.40	+.06
45	8.91	2.14	−7.02	2.71	2.56	+.18	131	20.67	8.21	−4.02	2.93	3.01	−.08
46	14.54	5.94	−4.47	3.29	3.44	−.15	132	20.41	8.30	−4.09	3.38	3.19	+.19
47	19.43	7.91	−2.67	3.44	3.24	+.20	133	20.59	9.28	−1.68	[illegible]	[illegible]	+.08
48	19.02	7.64	−3.41	3.55	3.15	+.40	134	22.08	10.15	−0.22	4.50	4.37	+.13
49	12.85	7.15	1.22	4.98	5.23	−.23	135	23.41	11.08	1.16	4.96	4.72	+.24
51	7.53	3.96	−0.42	4.43	4.60	−.17	136	22.39	10.22	0.50	4.74	4.30	+.44
52	6.33	4.42	0.25	4.65	4.64	+.01	137	23.17	10.56	−0.08	4.54	[illegible]	+.20
[illegible]	9.20	4.96	0.59	4.77	4.77	.00	138	24.92	11.54	0.47	4.73	4.66	+.07
54	12.53	5.60	−1.31	4.15	4.22	−.07	139	25.30	11.69	1.22	4.96	[illegible]	+.05
55	16.04	7.31	−1.66	4.04	4.05	−.01	140	12.63	6.53	−0.66	4.35	4.27	+.08
56	16.94	7.79	−1.31	4.15	4.15	.00	142	8.74	1.40	−5.55	3.08	2.90	+.18
57	14.06	6.42	−0.96	4.26	4.06	+.20	143	7.06	1.45	−6.36	[illegible]	2.80	+.05
59	13.24	6.51	0.11	4.60	4.50	+.10	144	6.09	2.03	−6.26	2.87	2.83	+.04
60	14.71	7.46	0.30	4.67	4.19	−.12	145	6.60	2.38	−6.22	2.88	2.86	+.02
61	14.29	7.19	0.64	4.78	4.69	+.09	146	6.50	2.31	−6.23	2.86	[illegible]	.00
62	14.89	7.86	0.81	4.67	4.60	+.07	147	8.05	1.95	−6.39	2.84	2.78	+.06
63	16.40	8.22	0.87	4.69	4.73	.04	148	8.70	2.22	−6.36	2.85	2.73	+.12
64	18.74	8.19	−2.33	3.85	3.78	+.07	149	10.58	2.36	−5.86	2.96	2.81	+.15
65	19.77	8.45	−2.60	3.78	3.62	+.16	150	10.46	2.21	−6.22	2.89	2.80	+.08
66	17.60	8.17	−0.72	4.34	4.27	+.07	151	10.61	2.31	−6.09	2.91	2.82	+.09
67	16.10	7.40	−1.17	4.19	4.18	+.06	152	[illegible]	[illegible]	−6.00	2.93	2.80	+.13
68	14.19	7.48	1.64	5.14	4.99	+.15	153	9.63	2.96	−3.92	2.93	2.82	+.12
69	16.71	9.20	2.78	5.67	5.62	+.05	154	8.66	2.89	−4.40	3.31	2.77	+.04
70	16.28	9.22	3.13	5.73	5.80	−.07	155	8.95	1.21	−3.13	[illegible]	3.57	+.05
71	14.91	8.42	2.90	5.62	[illegible]	+.06	156	8.76	1.05	−2.21	3.69	3.64	+.05
72	15.60	8.86	−4.37	3.31	3.38	−.07	157	8.40	[illegible]	−2.91	3.69	3.66	+.03
73	14.22	6.06	−3.28	3.59	3.67	−.08	158	8.26	0.55	−3.19	3.64	3.64	.00
74	12.71	5.68	−2.38	3.84	3.98	−.14	159	2.99	0.19	−3.59	3.51	[illegible]	+.02
75	11.66	5.65	−1.04	[illegible]	4.29	−.06	160	3.38	0.21	−3.83	3.45	[illegible]	+.06
76	9.53	4.96	−0.53	4.39	4.54	−.15	161	3.89	0.21	[illegible]	3.43	3.38	+.05
77	10.36	5.21	−0.26	4.49	4.51	−.02	165	3.09	0.55	−2.66	3.77	3.72	+.05
78	13.41	6.73	0.14	4.61	4.61	.00	166	3.30	0.60	−2.24	3.88	3.79	+.09
79	14.50	7.26	−0.17	4.51	4.69	−.18	167	[illegible]	0.95	−2.13	3.91	3.90	+.01
80	1.25	−1.95	−7.00	[illegible]	2.68	+.05	168	3.25	0.75	−2.19	3.89	3.81	+.08
81	21.29	8.47	−5.62	3.02	3.02	.00	169	4.40	1.50	−2.26	3.87	3.91	−.04
82	20.53	8.54	−4.73	3.22	3.40	−.18	170	3.06	0.59	−2.59	3.78	3.77	+.01
83	20.33	8.35	−4.97	3.17	3.19	−.02	171	3.38	0.75	−2.47	[illegible]	3.77	+.03
84	19.54	8.00	−4.64	3.26	[illegible]	−.03	172	3.12	0.73	−2.50	[illegible]	3.84	.00
85	18.16	7.41	−4.16	[illegible]	3.31	+0.06	173	[illegible]	0.71	−2.79	3.72	3.86	−.14

COLORADO SPRINGS—(FIRST SERIES)—Continued.

No.	τ	τ1	δ	p.			No.	τ	τ1	δ	p.		
				ϑ	C	ϑ−C					ϑ	C	ϑ−C
	°	°	°	mm.	mm.	mm.		°	°	°	mm.	mm.	mm.
174	2.97	0.58	−2.48	3.81	3.79	+0.02	195	14.17	9.21	4.96	6.49	6.65	−0.16
175	10.09	5.10	−0.34	4.45	4.52	− .07	196	5.39	3.69	1.89	5.23	5.25	− .02
176	10.32	5.16	−0.11	4.53	4.49	+ .04	197	5.94	4.13	2.31	5.39	5.39	.00
177	9.56	4.50	−1.08	4.21	4.23	− .02	198	5.97	3.33	0.58	4.76	4.72	+ .04
178	9.11	3.69	−2.54	3.79	3.75	+ .04	199	6.18	3.18	0.20	4.63	4.51	+ .12
179	8.73	3.15	−3.58	3.51	3.46	+ .05	200	4.63	2.30	−0.25	4.49	4.46	+ .03
180	8.50	2.74	−4.79	3.21	3.22	− .01	201	4.49	2.14	−0.16	4.52	4.38	+ .14
181	8.84	2.59	−5.23	3.10	2.97	+ .13	202	4.56	2.41	−0.01	4.56	4.56	.00
182	22.41	11.69	3.11	5.70	5.86	− .16	203	4.89	2.59	0.36	4.68	4.57	+ .11
183	25.35	12.32	1.78	5.19	5.33	− .14	204	6.16	3.88	1.47	5.07	5.09	− .02
184	26.29	12.91	2.19	5.34	5.60	− .26	205	6.68	4.26	1.69	5.16	5.20	− .04
185	13.89	8.06	3.11	5.70	5.66	+ .04	206	6.78	4.22	1.52	5.09	5.13	− .04
186	13.56	8.17	3.61	5.91	5.89	+ .02	207	6.72	4.21	1.54	5.10	5.15	− .05
187	13.67	8.61	4.17	6.14	6.28	− .14	208	17.13	11.41	7.45	7.70	7.71	− .01
188	11.35	7.56	4.20	6.15	6.20	− .05	209	21.53	9.95	−0.13	4.52	4.38	+ .14
189	11.58	7.55	3.75	5.96	6.13	− .17	210	20.06	9.25	−1.18	4.19	4.29	− .10
190	10.70	6.48	2.72	5.55	5.50	+ .05	211	12.48	8.03	3.96	6.05	6.21	− .16
191	10.65	6.42	2.42	5.43	5.46	− .03	212	12.91	8.21	3.94	6.04	6.20	− .16
192	10.44	5.99	2.10	5.31	5.17	+ .14	213	12.30	7.69	3.62	5.91	5.97	− .06
193	10.63	6.23	2.20	5.35	5.30	+ .05	214	9.53	6.05	2.97	5.64	4.57	+0.07
194	15.08	9.11	4.21	6.16	6.19	−0.03							

TRAIL HOUSE.

215	9.80	3.94	−2.47	3.81	3.85	−0.04	265	16.22	7.08	− 1.06	4.22	4.16	+0.06
216	9.77	4.03	−2.22	3.89	4.02	− .13	266	16.36	6.87	− 1.54	4.08	3.91	+ .17
217	7.26	2.16	−3.91	3.43	3.46	− .03	267	15.82	7.00	− 0.67	4.35	4.23	+ .12
218	7.79	2.56	−3.61	3.50	3.58	− .08	268	16.35	7.56	0.31	4.67	4.52	+ .15
219	9.83	3.91	−2.42	3.83	3.87	− .04	269	17.02	7.89	− 0.21	4.50	4.58	− .08
220	11.46	4.94	−1.25	4.17	4.18	− .01	270	16.98	7.16	− 1.21	4.18	3.94	+ .24
221	11.91	5.28	−1.26	4.17	4.20	− .03	271	17.71	7.41	− 2.29	3.86	3.90	− .04
222	12.22	5.65	−0.71	4.34	4.39	− .05	272	18.06	7.35	− 2.83	3.71	3.72	− .01
223	13.63	6.22	−1.15	4.20	4.38	− .18	273	18.64	7.61	− 2.29	3.86	3.72	+ .14
224	13.80	6.58	−0.28	4.48	4.63	− .15	274	18.35	7.37	− 2.50	3.81	3.61	+ .20
225	13.95	6.43	−0.57	4.38	4.44	− .06	275	12.20	7.06	2.76	5.56	5.62	− .06
226	13.65	6.43	−0.89	4.28	4.55	− .27	276	11.85	7.13	3.80	5.98	5.81	+ .17
227	9.19	3.72	−1.92	3.97	3.95	+ .02	277	12.71	7.43	3.08	5.67	5.75	− .08
228	10.85	4.72	−1.83	4.00	4.14	− .14	278	12.63	7.00	2.44	5.44	5.42	+ .02
229	12.06	5.44	−1.37	4.13	4.29	− .16	279	16.51	6.46	− 3.30	3.59	3.52	+ .07
230	13.49	6.04	−1.35	4.12	4.27	− .15	280	16.05	6.47	− 2.70	3.75	3.68	+ .07
231	13.25	5.05	−1.02	4.24	4.36	− .12	281	15.96	6.44	− 2.52	3.80	3.68	+ .12
232	13.06	6.01	−0.81	4.31	4.38	− .07	284	15.44	6.05	− 3.41	3.56	3.53	+ .03
233	14.33	6.89	−0.44	4.42	4.69	− .27	286	14.90	5.23	− 5.13	3.13	3.20	− .07
234	14.20	6.81	−0.98	4.27	4.66	− .39	287	6.19	−0.70	−11.29	1.94	2.81	+ .13
235	14.59	7.17	0.03	4.58	4.84	− .26	288	6.58	−0.50	−10.93	2.00	1.82	+ .18
236	14.91	7.49	0.47	4.73	5.01	− .28	289	6.78	−0.26	−10.58	2.05	1.91	+ .14
237	13.89	7.65	2.97	5.64	5.51	+ .13	290	8.87	0.98	− 9.58	2.22	2.01	+ .21
238	14.17	8.35	3.46	5.84	6.05	− .21	291	10.67	2.56	− 7.83	2.55	2.51	+ .04
239	14.29	6.97	0.30	4.67	4.78	− .11	292	11.20	2.68	− 7.70	2.57	2.51	+ .16
240	14.95	7.61	1.10	4.94	5.10	− .16	293	11.93	3.09	− 7.41	2.63	2.45	+ .18
241	15.14	7.08	−0.46	4.42	4.55	− .13	294	12.14	3.15	− 7.44	2.62	2.41	+ .21
242	14.67	6.97	−0.22	4.50	4.64	− .14	295	13.83	4.22	− 7.00	2.72	2.63	+ .09
243	14.80	7.13	−0.07	4.56	4.72	− .16	296	14.33	4.42	− 6.73	2.76	2.61	+ .15
244	15.00	7.40	−0.15	4.52	4.89	− .37	297	14.79	4.74	− 6.45	2.83	2.71	+ .12
245	16.44	8.00	0.39	4.70	4.89	− .19	298	14.39	4.31	− 7.12	2.69	2.54	+ .15
246	16.43	8.17	0.69	4.80	5.05	− .25	299	7.75	6.90	6.03	6.98	7.11	− .13
247	17.06	8.61	0.80	4.84	5.22	− .38	300	8.77	7.09	5.91	6.93	6.89	+ .04
248	16.67	8.60	1.24	4.99	5.36	− .37	301	10.11	7.73	5.80	6.88	6.97	− .09
249	16.35	8.52	1.83	5.21	5.41	− .20	302	11.09	7.98	5.54	6.75	6.85	− .10
250	16.47	8.75	2.05	5.28	5.58	− .30	303	9.49	3.78	− 2.56	3.79	3.89	− .10
251	14.68	7.59	1.58	5.12	5.18	− .06	304	10.17	3.67	− 3.09	3.64	3.55	+ .09
252	15.05	8.05	2.28	5.38	5.46	− .08	305	11.50	4.50	− 2.87	3.70	3.72	− .02
253	16.10	8.24	2.11	5.31	5.24	+ .07	306	12.36	4.89	− 2.20	3.89	3.73	+ .16
254	15.94	8.26	2.13	5.31	5.32	− .01	307	13.14	5.33	− 3.09	3.64	3.80	− .16
255	15.98	8.19	2.11	5.31	5.24	+ .07	308	14.25	5.53	− 3.22	3.62	3.55	+ .07
256	16.31	8.50	2.39	5.42	5.42	.00	309	16.53	6.75	− 2.04	3.94	3.74	+ .20
257	17.11	8.59	2.17	5.33	5.20	+ .13	310	17.94	7.28	− 3.14	3.63	3.70	− .07
258	16.72	9.91	4.87	6.45	6.59	− .14	311	18.17	7.02	− 3.70	3.48	3.37	+ .11
259	16.09	9.86	5.34	6.66	6.77	− .11	312	18.19	6.60	− 4.25	3.34	2.99	+ .35
260	16.09	9.61	5.22	6.60	6.52	+ .08	313	15.59	5.64	− 5.41	3.06	3.14	− .08
261	16.49	9.59	4.58	6.32	6.37	− .05	314	16.89	5.70	− 7.56	2.60	2.71	− .11
262	17.09	9.02	3.16	5.72	5.58	+ .14	315	17.50	6.19	− 5.72	2.99	2.90	+ .09
263	10.41	4.48	−1.04	4.23	4.10	+ .13	316	18.10	6.87	− 5.32	3.08	3.28	− .20
264	10.68	4.37	−1.65	4.05	3.92	+ .13	317	17.86	6.80	− 5.08	3.14	3.31	−0.17

TRAIL HOUSE—Continued.

No.	τ	τ_1	δ	p.			No.	τ	τ_1	δ	p.		
				ϑ	C	$\vartheta - C$					ϑ	C	$\vartheta - C$
	°	°	°	mm.	mm.	mm.		°	°	°	mm.	mm.	mm.
318	19.28	7.49	−4.00	3.41	3.38	+0.03	348	18.01	10.52	8.92	8.50	8.55	−0.05
319	18.83	7.10	−4.44	3.30	3.21	+ .09	349	14.17	11.20	9.44	8.81	8.81	.00
320	19.17	7.08	−5.56	3.03	3.05	− .02	350	14.86	11.50	9.25	8.69	8.86	− .17
321	18.68	7.04	−5.89	2.95	3.22	− .27	351	14.30	10.85	8.54	8.29	8.41	− .12
322	15.02	5.06	−6.22	2.88	2.88	.00	352	14.61	10.65	8.17	8.08	8.10	− .02
323	15.74	5.48	−5.84	2.97	2.97	.00	353	15.18	10.69	7.78	7.87	7.93	− .06
324	16.79	5.98	−5.50	3.04	3.00	+ .04	354	15.29	10.61	7.66	7.81	7.82	− .01
325	17.44	6.50	−5.39	3.06	3.21	− .15	355	9.29	5.23	1.57	5.11	5.13	− .02
326	17.96	6.83	−4.71	3.23	3.29	− .06	356	15.91	11.72	9.18	8.66	8.70	− .04
327	18.50	6.74	−6.16	2.89	3.01	− .12	357	16.07	12.15	9.78	9.00	9.11	− .11
328	18.34	6.52	−5.77	2.97	2.88	+ .09	358	15.84	11.96	10.07	9.18	9.16	+ .02
329	18.41	6.58	−6.22	2.88	2.87	+ .01	359	16.14	11.53	8.47	8.24	8.43	− .19
330	14.67	8.62	3.94	6.04	6.11	− .07	360	17.46	11.08	6.70	7.31	7.48	− .17
331	15.44	8.60	3.54	5.88	5.83	+ .05	361	17.83	11.62	7.63	7.79	7.90	− .11
332	17.85	7.48	−1.17	4.19	4.09	+ ,10	362	17.56	10.41	5.58	6.77	6.77	.00
333	18.11	7.16	−3.24	3.60	3.52	+ .08	363	17.91	10.14	4.83	6.43	6.39	+ .04
334	18.17	6.91	−3.56	3.52	3.27	+ .25	364	17.84	9.92	4.37	6.22	6.19	+ .03
335	14.41	6.69	−0.26	4.48	4.49	− .01	365	10.62	4.87	−0.53	4.40	4.37	+ .03
336	15.42	6.82	−1.25	4.17	4.21	− .04	366	10.62	4.91	−0.29	4.47	4.40	+ .07
337	15.61	7.05	−1.16	4.20	4.34	− .14	367	18.10	10.99	6.09	7.02	7.16	− .14
338	15.64	7.05	−1.10	4.22	4.33	− .11	368	18.79	9.65	2.41	5.46	4.57	− .11
339	16.08	7.43	−0.28	4.48	4.52	− .04	369	18.81	10.56	4.67	6.35	6.65	− .30
340	16.37	7.26	−0.81	4.31	4.25	+ .06	370	13.28	7.06	1.72	5.17	5.21	− .04
341	16.65	6.61	−3.53	3.52	3.55	− .03	371	13.78	7.33	2.13	5.30	5.28	+ .02
342	17.17	7.00	−2.72	3.74	3.74	.00	372	14.41	7.61	1.78	5.19	5.27	− .08
343	16.61	6.10	−4.04	3.40	3.17	+ .23	373	14.91	7.74	1.94	5.25	5.23	+ .02
344	16.76	6.58	−3.28	3.59	3.53	+ .06	374	15.50	8.35	2.69	5.53	5.56	− .03
345	13.72	10.22	8.09	8.04	7.99	+ .05	375	15.52	8.64	3.21	5.74	5.81	− .07
346	13.17	10.50	8.78	8.42	8.48	− .06	376	15.85	8.72	3.01	5.66	5.77	− .11
347	12.85	10.46	8.94	8.51	8.74	−0.23	377	16.59	8.99	3.08	5.69	5.76	−0.07

PIKE'S PEAK.

378	3.78	2.38	−3.90	3.43	3.47	−0.04	420	5.73	2.09	−1.09	4.22	4.18	+0.04
379	4.70	1.68	−1.24	4.17	4.23	− .06	421	5.04	1.70	−1.56	4.07	4.13	− .06
380	6.71	1.72	−3.06	3.65	3.64	+ .01	422	7.06	1.83	−3.22	3.61	3.61	.00
381	7.97	2.67	−2.03	3.94	3.90	+ .04	423	8.70	3.61	−0.64	4.36	4.32	+ .04
382	6.21	3.00	0.11	4.60	4.68	− .08	424	9.73	4.49	0.65	4.78	4.67	+ .11
383	6.40	3.27	0.54	4.75	4.80	− .05	425	8.19	4.24	0.93	4.88	4.97	− .09
384	6.14	3.44	1.09	4.94	5.02	− .08	426	9.13	4.55	1.01	4.91	4.90	+ .01
385	7.09	3.83	1.28	5.01	5.00	+ .01	427	9.04	4.44	0.83	4.85	4.86	− .01
386	6.45	3.71	1.71	5.16	5.11	+ .05	428	8.37	4.47	1.61	5.13	5.07	+ .06
387	6.76	4.19	2.08	5.28	5.37	− .09	429	8.56	4.39	1.44	5.07	4.97	+ .10
388	6.85	3.80	1.58	5.12	5.05	+ .07	430	7.74	4.11	1.28	5.01	5.00	+ .01
389	6.85	3.73	1.51	5.09	4.99	+ .10	431	7.36	3.78	1.21	4.98	4.89	+ .09
390	6.65	3.60	1.15	4.96	4.97	− .01	432	8.21	−1.37	−7.28	2.66	2.75	− .09
391	6.50	3.58	1.35	5.03	5.00	+ .03	433	8.41	−0.98	−5.93	2.94	2.91	+ .03
392	27.83	12.94	5.20	6.60	6.65	− .05	434	4.05	−0.63	−6.91	2.73	2.94	− .21
393	24.44	11.87	4.41	6.24	6.48	− .24	435	6.81	0.87	−7.20	2.67	2.73	− .06
394	23.47	11.63	4.81	6.42	6.54	− .12	436	9.28	2.20	−4.59	3.26	3.24	+ .02
395	23.03	11.60	5.03	6.52	6.63	− .11	437	10.18	2.77	−4.33	3.31	3.30	+ .01
396	22.68	11.39	4.95	6.48	6.57	− .09	438	9.63	2.62	−4.34	3.31	3.36	− .05
397	28.08	13.06	5.07	6.54	6.54	.00	439	9.44	1.76	−6.10	2.91	2.83	+ .08
398	28.57	13.20	4.78	6.41	6.53	− .12	440	10.62	3.17	−3.94	3.42	3.46	− .04
399	31.26	14.60	6.23	7.08	7.20	− .12	441	10.81	2.83	−4.83	3.20	3.13	+ .07
400	30.78	14.83	7.23	7.58	7.59	− .01	442	10.95	2.56	−5.92	2.95	2.91	+ .04
401	26.94	13.00	5.64	6.80	6.84	− .04	443	12.62	4.24	−3.39	3.56	3.60	− .04
402	6.12	1.49	−2.60	3.78	3.67	+ .11	444	13.47	5.18	−1.67	4.05	4.05	.00
403	7.22	2.72	−1.44	4.11	4.18	− .07	445	12.59	4.43	−2.49	3.81	3.75	+ .06
404	7.44	3.02	−1.00	4.25	4.32	− .07	446	11.61	3.39	−4.08	3.38	3.30	+ .08
405	8.22	3.41	−0.65	4.36	4.36	.00	447	7.34	0.82	−6.37	2.85	2.85	.00
406	8.85	4.59	1.25	5.00	5.02	− .02	448	7.87	1.30	−5.80	2.97	3.02	− .05
407	9.22	4.99	1.78	5.17	5.21	− .04	449	10.39	2.94	−3.98	3.42	3.36	+ .06
408	9.01	5.10	2.24	5.36	5.36	.00	450	9.13	2.08	−4.95	3.17	3.11	+ .06
409	9.44	5.13	2.10	5.31	5.25	+ .06	451	12.08	3.44	−3.94	3.42	3.20	+ .22
410	8.48	4.71	1.92	5.24	5.22	+ .02	452	12.50	3.94	−3.75	3.47	3.43	+ .04
411	7.89	4.24	1.35	5.03	5.02	+ .01	453	13.26	4.24	−3.60	3.48	3.41	+ .07
412	8.83	4.39	0.91	4.88	4.88	.00	454	12.70	4.07	−3.58	3.51	3.56	− .05
413	8.10	4.40	1.61	5.13	5.11	+ .02	455	12.13	4.07	−2.97	3.57	3.68	+ .04
414	8.42	4.22	0.98	4.88	4.88	.00	456	11.39	3.63	−3.15	3.63	3.54	+ .09
415	6.89	2.59	−1.28	4.16	4.19	− .03	457	9.58	3.89	−0.72	4.34	4.28	+ .06
416	7.11	2.22	−2.27	3.87	3.92	− .05	458	10.02	5.23	1.82	5.20	5.15	+ .05
417	8.72	3.38	−1.26	4.17	4.18	− .01	459	8.49	5.03	2.41	5.42	5.46	− .04
418	6.85	2.50	−1.55	4.08	4.15	− .07	460	7.91	5.28	3.20	5.74	5.84	− .10
419	6.22	2.29	−1.09	4.22	4.19	+0.03	461	8.80	5.27	2.72	5.54	5.58	−0.04

NOTE.—The experiments 392–401, inclusive, were made in a room artificially heated.

PIKE'S PEAK—Continued.

No.	τ	τ_1	δ	p.			No.	τ	τ_1	δ	p.		
				ϑ	C	$\vartheta-C$					ϑ	C	$\vartheta-C$
	°	°	°	mm.	mm.	mm.		°	°	°	mm.	mm.	mm.
462	9.87	5.76	2.92	5.62	5.59	+0.03	541	11.64	5.59	0.86	4.86	4.93	−0.07
463	11.22	6.30	2.78	5.57	5.62	− .05	542	10.28	4.28	−1.13	4.20	4.36	− .16
464	10.06	6.13	3.58	5.89	5.83	+ .06	543	10.48	4.83	−0.70	4.34	4.36	− .02
465	9.73	5.75	3.20	5.74	5.63	+ .11	544	12.08	5.52	0.29	4.66	4.76	− .10
466	9.47	5.91	3.56	5.89	5.84	+ .05	545	11.44	5.18	0.17	4.62	4.68	− .06
467	11.90	6.06	1.92	5.24	5.21	+ .03	546	12.24	5.61	0.56	4.76	4.77	− .01
468	12.46	6.39	2.18	5.32	5.31	+ .01	547	12.92	6.12	−.22	4.98	4.96	+ .02
469	10.40	5.13	1.31	5.02	4.96	+ .06	548	26.77	18.07	13.78	11.71	11.86	− .15
470	9.65	4.78	1.06	4.93	4.93	.00	549	25.28	15.40	10.07	9.18	8.97	+ .21
471	10.03	5.25	1.56	5.11	5.16	− .05	550	24.42	15.42	10.28	9.31	9.34	− .03
472	9.57	5.75	1.04	4.92	4.92	.00	551	22.30	14.35	9.48	8.82	8.93	− .11
473	9.85	5.33	2.16	5.32	5.28	+ .04	552	21.50	15.20	11.47	10.07	10.26	− .22
474	9.39	5.04	2.11	5.31	5.20	+ .11	553	23.36	15.40	11.14	9.86	9.75	+ .10
475	3.95	1.99	0.20	4.63	4.67	− .04	554	24.09	15.68	11.16	9.87	9.82	+ .05
476	3.92	1.97	0.18	4.62	4.66	− .04	555	25.53	15.94	10.86	9.68	9.55	+ .13
477	6.17	1.26	−3.39	3.56	3.49	+ .07	556	26.08	16.09	10.54	9.48	9.54	− .06
478	6.26	1.94	−1.96	3.96	3.94	+ .02	557	24.19	15.17	10.02	9.15	9.14	.01
479	6.75	2.08	−2.14	3.91	3.88	+ .03	558	24.44	15.04	9.72	8.97	8.87	+ .10
480	7.40	2.76	−1.12	4.21	4.14	+ .07	559	25.17	15.41	9.83	9.04	9.04	.00
481	8.00	2.63	−2.05	3.93	3.86	+ .07	560	25.09	15.40	9.82	9.03	9.05	− .02
482	8.15	2.61	−1.97	3.96	3.82	+ .14	561	25.42	15.65	10.17	9.24	9.15	+ .09
483	8.86	3.08	−1.92	3.97	3.89	+ .08	562	24.78	15.65	10.56	9.48	9.41	+ .07
484	10.89	5.06	0.86	4.85	4.75	+ .10	563	28.22	16.08	9.04	8.57	8.63	− .06
485	12.07	7.13	3.82	5.99	6.02	− .03	564	28.31	16.28	9.46	8.82	8.85	− .02
486	12.00	7.18	4.00	6.07	6.09	− .02	565	28.19	16.09	8.98	8.51	8.64	− .14
487	10.83	3.45	−3.18	3.61	3.58	+ .03	566	28.15	15.95	8.94	8.52	8.39	+ .03
488	11.31	4.01	−2.48	3.81	3.83	− .02	567	27.95	15.78	8.70	8.38	8.35	+ .03
489	11.21	4.20	−1.61	4.06	4.01	+ .05	568	27.70	15.51	8.46	8.24	8.11	+ .13
490	11.08	3.41	−3.53	3.52	3.48	− .04	569	27.12	15.74	9.41	8.79	8.65	+ .14
491	11.61	4.56	−1.85	3.99	4.16	− .17	570	27.06	16.10	10.11	9.21	9.11	+ .10
492	12.24	5.04	−0.41	4.43	4.33	+ .10	571	25.88	18.94	16.10	13.60	13.46	+ .14
493	10.17	5.94	3.14	5.71	5.60	+ .06	572	26.11	18.89	15.50	13.09	13.29	− .20
494	11.75	6.24	2.56	5.48	5.40	+ .08	573	26.80	19.62	16.45	13.90	14.05	− .15
495	11.48	7.06	4.19	6.15	6.14	+ .01	574	26.44	19.50	16.56	13.99	14.01	− .02
496	11.33	7.08	4.49	6.28	6.20	+ .08	575	26.18	19.70	16.89	14.30	14.42	− .12
497	11.54	3.29	−4.63	3.25	3.24	+ .01	576	25.89	19.43	16.90	14.30	14.14	+ .16
498	10.44	2.47	−5.61	3.02	3.00	+ .02	577	25.61	19.57	16.96	14.36	14.45	− .09
499	11.33	3.02	−5.34	3.08	3.12	− .04	578	25.41	19.50	17.14	14.52	14.84	− .32
500	11.61	3.68	−3.56	3.52	3.51	+ .01	579	25.30	18.38	15.44	13.03	12.89	+ .14
501	13.39	5.83	−2.20	3.89	3.81	+ .08	580	28.30	18.24	13.34	11.38	11.47	− .09
502	14.70	5.78	−1.12	4.21	4.14	+ .07	581	28.62	17.90	12.96	11.11	10.87	+ .24
503	14.75	7.06	1.78	5.19	5.14	+ .05	582	28.56	17.78	12.74	10.95	10.73	+ .22
504	12.57	6.01	1.15	4.96	4.97	− .01	583	27.83	17.47	12.13	10.52	10.61	− .09
505	11.61	5.47	0.94	4.89	4.85	+ .04	584	27.45	17.23	12.22	10.58	10.46	+ .12
506	11.44	5.34	0.85	4.86	4.81	+ .05	585	27.44	17.31	12.12	10.52	10.56	− .04
507	16.78	7.61	0.56	4.76	4.97	− .21	586	27.08	17.54	12.69	10.91	11.01	− .10
508	16.25	6.83	−0.93	4.27	4.50	− .23	587	28.75	18.83	13.98	11.87	12.11	− .24
509	16.33	6.64	−1.09	4.21	4.31	− .10	588	29.31	19.04	14.40	12.19	12.17	+ .02
510	15.94	6.53	−0.92	4.27	4.35	− .08	589	28.81	18.33	13.42	11.45	11.38	+ .07
511	10.11	3.90	−1.57	4.07	4.10	− .03	590	29.32	18.89	14.20	12.04	11.97	+ .07
512	9.21	3.50	−1.50	4.10	4.12	− .02	591	30.83	18.94	13.41	11.44	11.61	− .17
513	8.85	3.19	−1.72	4.03	4.00	+ .03	592	26.72	17.39	12.75	10.96	10.95	+ .01
514	8.88	3.69	−0.72	4.34	4.34	.00	593	26.08	16.81	12.27	10.61	10.44	+ .17
515	8.45	3.11	−1.66	4.05	4.07	− .02	594	25.37	16.39	11.32	9.98	10.19	− .21
516	8.47	3.14	−1.44	4.11	4.08	+ .03	595	26.98	18.65	14.67	12.41	12.58	− .17
517	8.31	3.11	−1.34	4.14	4.11	+ .03	596	25.83	18.26	14.66	12.40	12.51	− .11
518	6.73	0.66	−6.19	2.89	2.94	− .05	597	24.92	18.56	15.46	13.05	13.30	− .25
519	9.09	1.91	−5.63	3.01	3.05	− .03	598	24.87	18.96	16.30	13.77	13.95	− .17
520	8.62	1.40	−6.30	2.86	2.84	+ .02	599	25.83	18.92	15.75	13.29	13.44	− .15
521	9.20	2.22	−4.42	3.30	3.21	+ .09	600	24.75	19.63	17.14	14.52	14.89	− .37
522	10.86	4.61	−0.44	4.43	4.51	− .08	601	24.90	19.92	17.65	15.00	15.25	− .25
523	10.22	4.72	0.30	4.67	4.70	− .03	602	24.77	20.00	17.87	15.20	15.34	− .14
524	10.81	4.97	0.44	4.72	4.70	+ .02	603	17.26	14.59	13.22	11.30	11.26	+ .04
525	11.30	5.69	1.50	5.09	5.11	− .02	604	18.63	15.23	13.23	11.31	11.49	− .18
526	7.91	4.67	2.22	5.35	5.36	− .01	605	19.06	15.87	13.13	11.23	11.48	− .25
527	7.18	4.20	1.83	5.21	5.23	− .02	606	27.70	19.96	16.68	14.10	14.10	.00
528	10.71	4.57	−0.22	4.50	4.44	+ .06	607	28.70	20.18	16.44	13.89	14.09	− .20
529	9.88	4.04	−0.52	4.40	4.29	+ .11	608	28.28	18.20	13.56	11.55	11.42	+ .13
530	10.84	4.68	−0.24	4.49	4.48	+ .01	609	27.47	18.31	14.07	11.94	11.90	+ .04
531	10.88	5.69	1.78	5.19	5.25	− .06	610	27.24	18.36	14.29	12.11	12.06	+ .05
532	10.63	5.90	2.54	5.48	5.48	.00	611	26.84	18.41	14.30	12.12	12.30	− .18
533	9.60	5.39	2.14	5.32	5.36	− .04	612	24.45	18.87	15.58	13.15	13.22	− .07
534	9.40	3.92	−0.59	4.37	4.36	+ .01	613	23.94	18.28	15.71	13.26	13.30	− .04
535	9.02	3.80	−0.52	4.40	4.39	+ .01	614	23.28	18.17	15.76	13.30	13.43	− .13
536	8.25	3.59	0.08	4.57	4.48	+ .09	615	30.10	19.38	14.22	12.05	12.35	− .30
537	9.74	4.53	0.70	4.80	4.71	+ .09	616	30.70	19.08	13.25	11.31	11.66	− .35
538	10.83	5.00	−0.02	4.56	4.72	− .16	617	30.88	18.79	12.44	10.74	11.17	− .43
539	11.50	5.40	0.43	4.71	4.83	− .12	618	30.80	17.87	11.17	9.87	9.93	− .06
540	11.42	5.35	0.39	4.70	4.82	−0.12	619	30.82	17.61	10.67	9.55	9.57	−0.02

PIKE'S PEAK—Continued.

No.	τ	$τ_1$	ξ	p. δ	p. C	p. δ–C	No.	τ	$τ_1$	ξ	p. δ	p. C	p. δ–C
	°	°	°	mm.	mm.	mm.		°	°	°	mm.	mm.	mm.
620	31.26	17.16	9.43	8.80	8.76	+0.04	631	22.97	17.13	14.39	12.19	12.14	−0.05
621	30.69	16.73	9.22	8.73	8.44	+ .29	632	22.61	16.84	13.36	11.41	11.27	+ .14
622	29.65	17.72	11.61	10.17	10.19	− .02	633	22.24	16.42	13.25	11.32	11.51	− .19
623	29.45	17.39	11.05	9.80	9.81	− .01	634	22.02	16.24	13.22	11.30	11.37	− .07
624	29.62	16.53	9.58	8.89	8.62	+ .27	635	15.56	13.26	[illegible]	10.20	10.41	− .21
625	28.06	17.20	15.64	10.12	10.15	− .03	636	16.05	13.44	[illegible]	[illegible]	10.41	− .11
626	27.30	17.40	13.63	10.87	10.73	+ .14	637	26.10	19.65	17.00	14.40	14.38	+ .02
627	24.94	17.20	12.92	11.08	11.44	− .36	638	25.51	18.41	15.42	13.02	12.85	+ .17
628	22.44	16.65	13.54	11.54	11.73	− .19	639	24.48	17.17	13.73	[illegible]	11.59	+ .09
629	22.55	16.96	13.95	11.84	12.21	− .37	640	25.17	17.70	14.30	12.12	12.01	+0.11
630	22.72	17.28	14.60	12.27	12.46	−0.19							

WASHINGTON (SIMULTANEOUS EXPERIMENTS).

No.	τ	$τ_1$	ξ	δ	C	δ–C	No.	τ	$τ_1$	ξ	δ	C	δ–C
						−0.06	1	24.04	20.13	[illegible]	15.45	15.52	−0.07
						− .29	2	24.45	[illegible]	16.11	15.44	15.68	− .24
						− .23	3	24.69	20.46	16.21	15.53	15.72	− .19
						− .24	4	24.58	20.86	18.18	[illegible]	15.61	− .15
						− .09	5	24.65	20.43	11.86	15.60	15.60	.00
						− .17	6	24.55	20.42	11.37	15.90	15.73	+ .17
						− .32	7	19.96	15.14	9.90	10.34	10.37	− .03
						− .24	8	20.24	15.66	10.28	10.01	10.13	− .12
						− .14	9	19.63	13.96	11.03	9.13	9.06	+ .07
						− .20	10	19.74	14.29	11.26	[illegible]	9.36	− .05
						− .13	11	20.53	14.95	11.97	[illegible]	9.82	− .04
						− .26	12	20.[illegible]	15.22	11.95	9.04	10.03	− .09
						− .19	13	20.66	15.40	12.06	10.41	10.25	+ .16
						− .15	14	20.91	15.50	12.36	10.40	10.37	+ .03
						− .17	15	20.89	15.56	[illegible]	10.47	10.45	+ .02
						− .39	16	20.89	15.70	13.68	10.67	10.63	+ .04
						− .32	17	20.73	16.68	[illegible]	12.32	12.05	+ .27
						− .32	18	21.11	17.15	14.88	12.53	12.51	+ .02
						− .28	19	21.47	17.21	14.73	12.45	12.59	− .14
						− .41	20	21.43	17.60	15.30	12.62	13.02	− .40
						− .33	21	21.50	17.63	15.26	12.88	13.02	− .14
						− .06	22	26.61	22.33	20.44	17.84	17.86	− .02
						− .34	23	27.35	22.19	19.74	17.09	17.26	− .17
						− .21	24	28.04	[illegible]	19.85	16.68	16.79	− .11
						− .05	25	28.88	21.61	18.75	16.07	16.09	− .02
						− .30	26	29.30	20.60	16.75	14.20	13.94	+ .26
						− .12	27	29.85	20.15	15.25	12.88	12.61	+ .27
						− .18	28	29.84	19.94	14.30	12.12	12.27	− .15
						− .25	29	29.94	19.69	13.94	11.84	11.63	+ .01
						− .03	30	30.09	19.52	13.55	11.54	11.48	+ .06
						− .07	31	29.94	[illegible]	13.39	11.43	11.50	− .07
						....	32	22.91	16.65	13.15	11.25	11.19	+ .06
						....	33	22.78	16.70	13.05	11.17	11.00	+ .17
674	....	....	....	....	....	....	34	22.63	16.39	12.55	10.82	10.70	+ .12
675	22.89	16.70	12.50	10.78	10.99	− .21	35	22.69	16.70	[illegible]	10.76	10.99	− .23
676	22.77	16.67	12.58	[illegible]	11.02	− .19	36	22.80	16.70	12.70	10.92	11.04	− .12
677	[illegible]	16.67	12.56	10.81	10.95	− .14	37	22.88	16.70	12.70	10.92	10.99	− .07
678	23.06	18.64	16.11	13.61	13.72	− .11	38	23.19	18.64	16.06	13.56	13.66	− .10
679	[illegible]	18.87	15.94	13.47	13.42	+ .05	39	24.20	18.84	15.68	13.41	13.46	− .05
680	24.13	18.80	15.86	13.40	13.43	− .03	40	23.94	18.61	15.50	13.09	[illegible]	− .15
681	24.20	18.86	16.02	13.53	13.49	− .04	41	23.93	18.75	15.70	13.25	13.46	− .21
682	23.91	18.78	16.00	13.51	13.51	.00	42	24.00	18.76	15.67	13.23	13.44	− .21
683	23.66	18.32	16.06	13.57	13.60	− .03	43	23.88	18.80	15.73	13.32	13.56	− .21
684	24.22	18.69	15.94	13.46	13.50	− .04	44	24.10	18.66	15.65	13.38	13.54	− .16
685	20.50	17.16	15.31	12.93	12.84	+ .09	45	20.50	17.06	15.63	12.54	12.73	− .19
686	21.67	17.66	15.61	13.18	12.99	+ .19	46	21.61	17.66	15.16	12.80	13.01	− .21
687	22.22	17.69	15.55	13.13	13.04	+ .09	47	22.44	17.92	15.39	13.00	12.97	+ .03
688	23.35	18.33	15.46	13.06	13.12	− .06	48	[illegible]	18.46	15.41	13.01	[illegible]	− .04
689	23.34	17.56	13.91	11.82	11.95	− .13	49	23.43	17.47	14.00	11.88	11.82	+ .06
690	[illegible]	17.24	13.31	11.36	11.46	− .10	50	[illegible]	17.24	[illegible]	11.55	11.42	+ .13
691	23.67	17.06	12.59	10.84	11.11	− .27	51	23.76	17.02	13.20	11.28	11.01	+ .27
692	23.71	16.89	12.60	10.78	10.84	− .06	52	23.76	16.94	12.58	10.83	10.90	− .07
693	27.70	18.47	12.76	10.96	11.11	− .15	53	28.28	18.80	13.03	11.15	11.31	− .16
694	27.81	[illegible]	[illegible]	11.12	11.28	− .16	54	28.41	18.78	12.94	11.09	[illegible]	− .13
695	19.00	12.80	7.59	7.77	7.86	− .09	55	19.79	13.01	7.28	7.61	7.71	− .10
696	22.68	14.88	9.06	8.58	8.57	+ .01	56	22.83	14.88	[illegible]	8.43	8.49	− .06
697	23.00	15.01	9.19	8.66	[illegible]	+ .08	57	23.97	14.93	8.89	[illegible]	8.55	− .06
698	23.16	15.08	9.39	[illegible]	8.65	+0.13	58	23.21	15.05	9.12	8.62	8.56	+0.04

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No.	τ	τ_1	δ	p. ϑ	p. C	p. $\vartheta-C$	No.	τ	τ_1	δ	p. ϑ	p. C	p. $\vartheta-C$
	°	°	°	mm.	mm.	mm.		°	°	°	mm.	mm.	mm.
1	20.73	11.50	2.44	5.44	5.43	+0.01	28	1.11	−1.28	−6.06	2.92	2.95	−0.03
2	19.06	9.56	−1.83	4.15	4.06	+ .09	29	−0.78	−2.94	−7.89	2.53	2.58	− .05
3	17.39	8.67	−2.17	3.90	3.95	− .05	30	−5.56	−5.67	−6.00	2.93	2.94	− .01
4	20.39	10.61	0.67	4.79	4.56	+ .23	31	−2.09	−2.72	−3.78	3.45	3.44	+ .01
5	26.61	17.28	11.22	9.91	9.94	− .03	32	0.72	−1.83	−7.00	2.72	2.71	+ .01
6	19.17	10.06	−0.28	4.47	4.57	− .10	33	1.44	−1.33	−6.56	2.81	2.75	+ .06
7	6.22	2.39	−3.39	3.56	3.48	+ .08	34	2.61	−0.89	−6.89	2.74	2.51	+ .23
8	7.78	3.17	−4.22	3.35	3.40	− .05	35	4.06	−0.06	−6.89	2.74	2.48	+ .26
9	4.44	0.17	−8.22	2.47	2.46	+ .01	36	−14.22	−14.94	−22.00	0.79	1.09	− .30
10	1.44	0.56	−0.39	4.44	4.30	+ .14	37	−11.89	−13.11	−21.00	0.87	1.07	− .20
11	4.48	2.80	0.89	4.87	4.80	+ .07	38	−10.39	−11.83	−21.06	0.86	1.13	− .27
12	4.94	0.44	−6.94	2.72	2.44	+ .28	39	−9.94	−11.22	−20.67	0.89	1.30	− .41
13	6.22	1.28	−6.78	2.76	2.51	+ .25	40	−3.75	−5.50	−10.28	2.11	2.15	− .04
14	9.00	2.50	−8.17	2.48	2.18	+ .30	41	−10.89	−11.67	−15.44	1.39	1.48	− .09
15	8.89	2.94	−7.89	2.53	2.64	− .11	42	−10.33	−11.11	−14.56	1.49	1.57	− .08
16	7.11	2.11	−6.00	2.93	2.79	+ .14	43	−12.38	−13.25	−19.00	1.03	1.22	− .19
17	1.11	−1.28	−5.22	3.11	2.94	+ .17	44	−3.17	−5.78	−14.17	1.54	1.20	+ .34
18	1.56	−0.50	−4.06	3.39	3.37	+ .02	45	−7.89	−9.17	−15.72	1.36	1.39	− .03
19	−1.22	−3.89	−8.83	2.46	2.46	.00	46	−6.30	−8.78	−17.78	1.14	1.15	− .01
20	1.06	−1.39	−6.06	2.92	2.89	+ .03	47	−9.39	−10.83	−17.83	1.18	1.30	− .12
21	1.72	−1.00	−5.56	3.03	2.88	+ .15	48	−1.78	−5.00	−13.89	1.64	1.54	+ .10
22	2.11	−1.44	−8.56	2.41	2.31	+ .10	49	0.39	−1.61	−5.72	2.99	3.05	− .06
23	−0.56	−2.78	−7.89	2.53	2.61	− .08	50	−4.06	−6.61	−14.22	1.53	1.51	+ .02
*	*	*	*	*	*	*	51	−4.17	−7.28	−19.44	0.99	1.09	− .10
*	*	*	*	*	*	*	52	−3.50	−6.72	−17.00	1.22	1.15	+ .07
24	−1.22	−3.39	−8.22	2.47	2.46	+ .01	53	−10.22	−12.33	−22.88	0.70	0.72	− .02
25	−2.56	−4.94	−11.17	1.96	1.97	− .01	54	−11.83	−13.17	−20.72	0.89	1.01	− .12
26	−1.28	−2.83	−5.78	2.97	2.92	+ .05	55	−0.56	−2.11	−7.78	2.56	2.57	− .01
27	0.44	−1.78	−5.74	2.99	2.89	+0.10	56	−0.92	−1.72	−7.56	2.60	2.69	−0.09

* Wet bulb covered with ice.

From the pyschrometric formula, equation (1), we get:

$$A=\frac{p_1-p}{P(\tau-\tau_1)} \tag{2}$$

From this, with the data given in the preceding table, since p_1 and p are the maximum vapor tensions corresponding to τ_1 and δ respectively, we get the value of A, which satisfies each experiment.

The most probable value of AP from a number of experiments made at the same station, by the principle of least squares, is sensibly

$$AP=\frac{\Sigma(p_1-p)\ (\tau-\tau_1)}{\Sigma(\tau-\tau_1)} \tag{3}$$

since in a number of experiments the average value of P can be used without sensible error. In combining, however, the experiments made at different altitudes we must put

$$A=\frac{(\Sigma p_1-p)\ \tau-\tau_1)}{\Sigma P(\tau-\tau_1)} \tag{4}$$

But in this the average value of P can be used in all the experiments of any one station.

From the data given by the experiments the values of (p_1-p) $(\tau-\tau_1)$ and of $\tau-\tau_1$ were computed for each experiment. In this the revised table of vapor tensions, published by the authority of the International Commitee on Weights and Measures, has been used.

Since the value of A, by theory, is in a very small measure a function of τ_1, the experiments at Colorado Springs have been divided into seven groups according to the velues of τ_1, from which the following table of results have been obtained for each group, of which the average value of τ_1 is that contained in the second column. The values of AP in the last column are obtained from those of the two preceding columns by means of (3).

Number of experiments.	τ_1	$\Sigma(P_1-p)(\tau-\tau_1)$	$\Sigma(\tau-\tau_1)$	AP
	°			
50	1.0	322.6	807.6	0.3994
59	4.6	1266.9	3138.4	0.4037
70	7.4	2639.9	6573.1	0.4016
16	10.0	757.1	1880.1	0.4027
5	13.5	179.6	423.9	0.4237
51	16.5	2004.4	4947.5	0.4052
38	18.9	1048.6	2505.9	0.4184

But few experiments fall into the middle groups, because part of the experiments were made in the early part of spring, before the observer ascended the mountain to the Trail House and Pike's Peak, and the balance, in order to get the other extreme of temperatures, after he returned in July. The relative weights of these determinations of AP are as the numbers under the heading, $\Sigma(\tau-\tau_1)$.

9. Regarding AP now as a function of the first power of τ_1, the part depending on τ_1 being very small, we can put:

$$AP = 0.4 + P\delta A_0 + e\tau_1 \tag{5}$$

in which

$$A_0P = 0.4 + P\delta A_0 \tag{6}$$

is the value of AP where $\tau_1=0$, and in which δA_0 is a small correction of A_0 in the first assumed value of $A_0P = 0.4$.

From (5) we get with the values of AP and of τ_1 in the preceding table, seven equations of condition for determining the most probable values of the two quantities, δA_0 and e,

$$\begin{aligned}
P\delta A_0 + 1.0e &= -.0006\\
P\delta A_0 + 4.6e &= +.0037\\
P\delta A_0 + 7.4e &= +.0016\\
P\delta A_0 + 10.0e &= +.0027\\
P\delta A_0 + 13.5e &= +.0237\\
P\delta A_0 + 16.5e &= +.0052\\
P\delta A_0 + 18.9e &= +.0184
\end{aligned}$$

Giving these equations weights in proportion to the preceding values of $\Sigma(\tau-\tau_1)$ and solving by the method of least squares, we get

$$P\delta A_0 = -0.0027 \pm 0.0008$$

$$e = 0.00075 \pm 0.000069 \tag{7}$$

Hence we get by (6) $A_0P = 0.3973 \pm 0.0008$. The estimated average value of P for all the experiments at Colorado Springs is 611^{mm}. We therefore get

$$A_0 = 0.00065 \pm 0.0000013 \tag{8}$$

Dividing (5) by $P=611$ we get, by means of (6), (7), and (8)

$$A = A_0 + \frac{e}{611}\tau_1 = 0.000650(1 + 0.0019\tau_1) \tag{9}$$

10. The part in this expression of A, depending upon τ_1, it is well known, arises from a similar term in the expression of the latent heat of water. This, by the former expression of latent heat used in Regnault's formula, is $1:610 = 0.00164$. By the expression of the latent heat of water as determined by Regnault, and now used, this coefficient is $0.695:606.5 = 0.00115$. This is considerably less than the coefficient above, obtained from the experiments at Colorado Springs, and from the probable error in (7), and consequently of this coefficient, it would seem that the true value cannot be so small. But in the method of obtaining probable errors it is assumed that the error in each individual observation is as liable to be in error in the one direction as the other. The determination of this coefficient from the experiments depends in a great measure upon a comparison of the results obtained from the experiments at Colorado Springs in the

spring with those from the experiments made in midsummer after the return from Pike's Peak, and we cannot assume that during this time there may not have been some slight change in the instruments or the method of observing which caused a slight change in the relation between the results obtained at the two seasons which was constant in the same direction. It would require a very small change of this sort to cause the difference between the theoretic value of the constant above and that obtained from the experiments, since we are here dealing with a very small term in which the difference between the two values is somewhat of the order of the probable error in its determination from the experiments. For the present, therefore, until further research on the subject, it is perhaps safest to use the coefficient given by Regnault's expression of the latent heat of water, since we know that this is a real effect which must come into the formula; but still we cannot be sure that in the theory, based upon an imperfect and approximate application of the diffusion theory of gases, there may not be some small modifying effects not taken into account which would change the value of this coefficient in the one direction or the other. We shall therefore put

$$A = A_0 \, (1 + 0.00115 \, \tau_1) \tag{10}$$

11. With the data obtained from the 100 experiments at the Trail House, the estimated average value of P being 550^{mm}, we get from (3)

$$A = \frac{3798}{550 \times 10297} = 0.000671 \tag{11}$$

The values of τ_1 in these experiments are confined within a small range and so all the experiments are included in one group. This value corresponds to the average of τ_1 $6^\circ.9$.

In the same manner we get from the 170 experiments on Pike's Peak, the estimated average value of P being 461^{mm},

$$A = \frac{2225}{461 \times 7325} = 0.000668 \tag{12}$$

This corrresponds to an average value of $\tau_1 = 4^\circ.4$.

From 55 of the 58 experiments made by Marvin at Washington, with an average barometric pressure $P = 763^{mm}$, we get from (3)

$$A = \frac{1114}{763 \times 2116} = 0.000690 \tag{13}$$

corresponding to an average value $\tau_1 = 17^\circ.8$.

From Hazen's 58 simultaneous experiments, made under the same conditions, we get from (3)

$$A = \frac{1155}{763 \times 2264} = 0.000669 \tag{14}$$

From the 16 experiments made by Hazen in Massachusetts, with $\tau_1 > 0^\circ$ and an estimated average of $P = 760^{mm}$, we get

$$A = \frac{359}{760 \times 722} = 0.000654 \tag{15}$$

corresponding to an average value of $\tau_1 = 5^\circ.4$.

12. The following is a summary of the results obtained at the several stations:

Station.	Number of experiments.	P	τ_1	A	A_0
		mm.	°		
Colorado Springs	289	611	9.1	....	0.000650
Trail House	160	550	7.0	0.000671	666
Pike's Peak	170	461	4.4	668	664
Washington:					
Marvin	55	763	17.8	690	676
Hazen	58	763	17.8	669	656
Hazen	16	760	5.4	654	650

With the values of A and τ_1 that of A_0 has been obtained from (10), except in the case of Colorado Springs, which has been treated in a different manner by dividing the experiments into different groups with reference to the values of τ_1, in order to obtain a verification of the coefficient of τ_1 in (10). The relative weights in these determinations of A_0 are as the denominators in the preceding expressions of A. Considering the great range of altitude of the stations from sea level up to the top of Pike's Peak, the values of A_0 obtained at the several stations agree with one another remarkably well, for the greatest difference of any of them from the average corresponds to only 0.15^{mm} of vapor tension in the formula (1), with a value of $\tau-\tau_1=10^\circ$.

From the combination of all the 751 experiments we get, using (4) instead of (3) in this case,

$$A=\frac{16899}{25318700}=0.000667 \tag{16}$$

corresponding to an average value for all the experiments of $\tau_1=8^\circ.9$. With these values of A and τ_1 (10) gives

$$A_0=0.000660 \tag{17}$$

as the most probable value deduced from all of the experiments. If this last reduction had been made by means of (9) instead of (10) we should have $A_0=0.000656$. It is with this value that the value of A_0 in (8) should be compared in comparing the constant deduced from the experiments at Colorado Springs with the most probable value deduced from all. It is this latter value which should be used if the coefficient of τ_1 in (9) is adopted. In either case the psychrometric formula would agree for the value of $\tau_1=8^\circ.9$.

13. From the whole number of experiments made by Marvin with Regnault's hygrometer, 677 in number, we get in the same manner as in the preceding examples, $A_0=0.000661$. From the 74 experiments made by Hazen, in which the temperature of the wet bulb was above freezing, and in which Alluard's hygrometer was used, we get in like manner $A_0=0.000654$. The average value of $\tau-\tau_1$ in these latter experiments is $6^\circ.1$. Hence, using the difference between these values of A_0, an average decrease of $0.00007\times760\times6^\circ.1=0.032^{mm}$ in the indications of Alluard's hygrometer reduces them to the same as those given by Regnault's hygrometer, if we suppose that the readings of the two psychrometers are precisely the same. But from the 55 simultaneous comparative experiments of Marvin and Hazen we get by means of a differential formula and the differences between their readings, the average difference of the vapor tensions (Marvin — Hazen), equal 0.040^{mm}. Hence we shall have the average difference of the vapor tensions given by the hygrometers (Alluard — Regnault) equal 0.072^{mm}.

Sworykin found from his comparative experiments the difference between the vapor tensions given by Alluard's and Swackhöffer's volume hygrometer (Alluard—volume hygrometer) equal 0.10^{mm}. Hence it would seem that the indications of Regnault's hygrometer and the volume hygrometer are very nearly the same, and that the difference between the indications of Alluard's hygrometer and those of either of the others is very small.

14. The estimated velocity of whirling of the psychrometer in the experiments was 25 feet per second.

The thermometers were cylindrical, of the following dimensions: Dry-bulb, No. 979, length 18^{mm}, and diameter 3.8^{mm}; wet-bulb, No. 85, length 23^{mm}, and diameter 4^{mm}, approximately.

From numerous comparative experiments it is shown that with a velocity of 12 feet per second and upwards there are no sensible differences in the depressions of the wet-bulb temperatures $\tau-\tau_1$, either for different sizes or shapes of the bulbs or for different velocities of whirling. The following table contains the results in Fahrenheit degrees of twenty-one experiments made at Colorado Springs, with an estimated velocity of whirling of 25 feet per second:

Cylindrical bulbs.			Spherical bulbs.		
Dry, No. 979. τ	Wet, No. 85. τ_1	$\tau-\tau_1$	Dry, No. 727. τ	Wet, No. 721. τ_1	$\tau-\tau_1$
°	°	°	°	°	°
62.83	52.55	10.28	63.10	52.32	10.78
70.75	49.92	20.83	70.92	49.87	21.05
68.13	48.65	19.48	68.20	48.54	19.66
61.15	50.04	11.11	61.86	50.02	11.84
57.42	49.12	8.30	57.49	49.24	8.25
61.82	49.93	11.89	62.11	49.74	12.37
61.33	49.79	11.54	61.51	49.71	11.80
63.24	52.15	11.09	63.48	52.12	11.36
64.62	52.03	12.59	64.73	52.07	12.66
63.03	51.64	11.39	63.22	51.65	11.57
62.72	50.72	12.00	62.82	50.75	12.07
63.24	50.83	12.41	63.18	50.87	12.31
62.33	50.50	11.83	62.42	50.54	11.88
70.66	47.56	23.10	70.66	47.48	23.18
70.39	47.17	23.22	70.80	47.31	23.49
70.38	46.65	23.73	70.30	46.54	23.76
71.20	47.58	23.62	71.12	47.44	23.68
71.38	47.20	24.18	71.38	47.16	24.22
74.42	48.96	25.46	74.06	48.52	25.54
74.17	49.38	24.79	74.42	49.36	25.06
74.99	49.47	25.52	75.04	49.42	25.62
66.68	49.61	17.07	66.78	49.56	17.22

Each one of the temperatures in this table is the average of about ten readings of the thermometer, all being read forward and back alternately in such a manner as to make the averages in each experiment the same as those of simultaneous readings. It is seen that the temperature depression $\tau-\tau_1$ upon the whole, and mostly in each experiment, contrary to what we would expect, is smaller in the cylindrical than in the spherical bulbs, but the amount is very small and may be due to instrumental errors. It is seen that it arises mostly from the differences in the readings of the dry-bulb thermometers, only one-third of it being due to differences in the readings of the wet-bulb thermometers. The diameter of the spherical bulbs was $\frac{7}{16}$ of an inch; the dimensions of the cylindrical ones, as given above.

The following table contains the depressions $\tau-\tau_1$, in two sets of three experiments each, made at Colorado Springs with the same cylindrical thermometers, first with the psychrometer still, and then with estimated whirling velocities per second, as given:

First set.			Second set.		
Still.	8 feet.	25 feet.	Still.	12 feet.	25 feet.
°	°	°	°	°	°
13.07	13.80	13.85	8.49	9.22	9.12
12.93	13.96	13.95	9.76	9.97	10.09
13.51	14.53	14.74	19.82	21.61	21.53
13.17	14.10	14.18	12.69	13.60	13.58

These experiments were made in a room not entirely closed, but in which there was but little agitation of the air. The following were made under the same conditions at Pike's Peak:

Still.	12 feet.	25 feet.
°	°	°
11.21	12.02	12.04
9.17	10.89	10.84
8.61	10.46	10.44
9.66	11.12	11.11

In each of these experiments the depressions of the wet-bulb temperatures $\tau-\tau_1$, are greater with the psychrometer whirled than with it not whirled, and on the average the depression is a very little greater with a velocity of 25 feet than with a velocity of 8 feet, but there does not seem to be any sensible difference in velocities of 12 feet and 25 feet per second. In the last two tables, as in the preceding one, the numbers are the averages from ten readings of the instruments.

15. From all of the preceding experiments we may infer that with cylindrical bulbs the maximum depression of the wet-bulb temperature is reached sensibly with a velocity of whirling of 10 feet per second, and that with a velocity of 25 feet, at least, there is no sensible difference in this depression between cylindrical and spherical bulbs, and that the difference most probable vanishes sensibly at 10 feet per second. If so, the same value of the constant A in the psychrometric formula can be used for all shapes and sizes of thermometer bulbs, and for all velocities of ventilation of 10 feet or more per second, or at least for velocities of 15 feet and over in the case of large spherical bulbs. This agrees very well with the results obtained by Sworykin, given in the table of section 5, in which the minimum constant required, and consequently the greatest depression or value of $\tau-\tau_1$, with small cylindrical bulbs, is very nearly reached with a velocity of ventilation of 3 meters per second, and in the case of large spherical bulbs, the minimum value, of A or greatest value of $\tau-\tau_1$, and a value very nearly the same as in the case of the small cylindrical bulbs, is reached with a velocity of about 5 meters per second. Sworykin's minimum value of A for his small cylindrical thermometers also agrees very well with the most probable value 0.000660, which is here obtained (17) from all the experiments with the same kind of thermometers, the whole difference being of no consequence in any practical application of the formula.

16. The following values of A have been obtained from experiments made with a sling psychrometer and a condensing hygrometer: Doyére* from 22 experiments made in 1855, $A=0.000678$; and Lépenay† from 11 experiments a few years ago, $A=0.000693$. These experiments were probably made in summer, or at least with medium temperatures, and so should be a little greater than the valve above reduced to freezing. But still they are a little larger than that above, while Sworykin's is about as much smaller.

17. From the 7 experiments made by Hazen in Massachusetts with bulb not covered with ice, but in which $\tau_1 < 0°$, we get from (3)

$$A=\frac{21.8}{760\times45.5}=0.000627 \tag{18}$$

corresponding to an average value of $\tau_1=-1.7°$. Although this determination has but little weight on account of the fewness of the experiments and the small ranges of $\tau-\tau_1$, yet it does not differ materially from the other values of A, determined from much larger groups.

There is, however, considerable uncertainty in the indications of the psychrometer when the temperature of the wet bulb is below 0°, and yet is not covered with ice, since if the water should be in the act of freezing and the freezing be not yet perceptible, they would be very erroneous. The latent heat given out in freezing causes the reading of the wet-bulb thermometer to be too high, for this is a source of heat not taken into account in the theory of the formula, nor is the constant of the formula adapted to such a condition. Experiments 162, 163, and 164, not included in the table of section 7, were of this character according to the marginal note of the experimenter. These give a value of $A=0.0008$, indicating that the temperature of the wet bulb was much too high for ordinary conditions.

18. From the 33 experiments in the table of section 7, in which the wet bulb was covered with ice, we get from (3)

$$A=\frac{82.3}{760\times161.8}=0.000670 \tag{19}$$

corresponding to a value of $\tau=-6°.5$. This is a little larger than the value of (17), although it is well known, according to theory, it ought to be about one-eighth less. The fault is doubtless not in the theory but in the temperature of the wet bulb, which cools slowly when it is covered with ice on account of its small conductivity for heat, so that the bulb does not become cooled down to the minimum with the usual amount of whirling. The average range of $\tau-\tau_1$ in the 33 experiments is only 2°.0, and with this value at the temperature of $-6°.5$, a diminution of 0°.2 in the wet-bulb temperature would decrease the value of the constant deduced from the experiments the requisite amount to make it agree with the requirements of theory. With the temperatures,

* Paris Ann. Soc. Met., III, 1855, page 60. †Journal de Physique, X, 1881.

therefore, of the ice-covered bulb as usually taken, without long continued ventilation, the same constant can be used in the formula for temperatures of the wet bulb either above or below the freezing point. At any rate an error of one-eighth part in the constant at these low temperatures rarely gives rise to an error in the vapor tension of 0.2 mm., and generally much less

19. The psychrometric formula (1) by means of (10) and (17) becomes

$$(20) \qquad p=p_1-0.000660\,P(\tau-\tau_1)\,(1+0.00115\,\tau_1)$$

Since the part of this expression depending upon τ_1 is very small, and it is found from experiment, upon the average, that $\tau-\tau_1$ does not differ much from τ_1, we can put without material error for the sake of rendering the expression more convenient for tabulation,

$$(21) \qquad p=p_1-0.000660\,P\,(\tau-\tau_1)\left(1+0.00115\,(\tau-\tau_1)\right)$$

in which the error will be in each instance,

$$(22) \qquad E=0.00000076\,P\,(\tau-\tau_1)\,(\tau-2\tau_1)$$

This rarely amounts to as much as 0.05^{mm} in the vapor tension.

From what has been stated (20) or (21) can be applied in case the wet bulb is covered with ice, at least when the observation of the wet-bulb temperature is taken with only the usual amount of whirling. And this agrees with the experiments of Sworykin, who found that they were equally well represented by the formula with the same value of A for all temperatures from $-10°$ up to $+23°$. The number of his experiments and the range of temperature were scarcely sufficient to bring out the small effect in (20) depending upon τ_1.

The first term in the expression of (21), being a function of τ_1 is obtained with $\tau=\tau_1$, as an argument from Table IV, which is an abridgment of that recently published by the International Bureau of Weights and Measures. The last term of (21), being a function of $\tau-\tau_1$ and P, is obtained from Table V, with these quantities as arguments. Hence we have

$$(23) \qquad P=\text{Table IV}-\text{Table V}.$$

This very convenient arrangement of tabulation and use of the formula was first devised and recommended by Kaemtz. (*Lehrbuch der Meteorologie, Band* 1.)

20. From (23), by means of the tables, the values of P in the tables of section 7, under the heading C have been obtained for each of the 791 experiments. The values P under the heading have been obtained from the table of the International Bureau of Weights and Measures, with the observed dew-point of the condensing hygrometers as an argument. The residuals, $\theta-C$, are the differences between the vapor tensions given by the hygrometer and the whirled psychrometer by means of Tables IV and V In the latter the average value of P for each station was used, but the part of the residuals due to this cause is small, since there was, in general, but little fluctuation of barometric pressure.

The value of E (22) was computed for each one of the experiments, and found, on the average, to amount to only 0.016^{mm}, and only in one case did its value amount to as much as 0.05^{mm}. The errors, therefore, due to this cause are of no importance.

21. Considering the hygrometers (Regnault's mostly) as true standards of comparison, it is seen from the residuals, $\theta-C$, that the psychrometer in its application in nearly 800 experiments, made in Colorado, at Washington, and in Massachusetts, and at stations ranging in altitude from sea-level to the top of Pike's Peak, and for a large range of temperature, has given with the same constant in the formula and the same table, very satisfactory results. The probable error, as deduced from the residuals, is only 0.084^{mm}, and the greatest residual only 0.49^{mm}. But the probable error thus deduced is the probable difference simply in any one comparison of the two methods of obtaining the vapor tension, in which the hygrometer must have its share of the error. In the simultaneous experiments of Marvin and Hazen it is found that the principal part of the differences in their results is due to the differences of the observed dew-points, and not to differences in the temperature readings of the psychrometer. The probable error, therefore, of the psychrometer in any one observation of the average weight of the experiments above is only about 0.05^{mm}. But this implies that the observation should be the average of ten readings of the thermometers, made with the same care as in the experiments. So when there is, as usual, only one reading of each thermometer, the probable error of course will be considerable more.

22. In order to test the applicability of the formula and tables to very high temperatures, a few experiments were made by Professors Marvin and Hazen, conjointly, in Dr. Bové's Turkish baths, Washington, the results of which are contained in the following table.

No.	τ	τ_1	δ	p		
				θ	C	$\theta-C$
	°	°		mm.	mm.	mm.
1	57.79	32.18	21.35	18.87	22.44	—3.57
2	59.29	32.40	22.92	20.75	22.33	—1.58
3	57.78	31.44	21.66	19.22	20.75	—1.53
4	59.29	32.39	21.56	19.11	22.32	—3.21

It is seen that the Tables IV and V give vapor tensions too great in each case for that obtained from the observed dew-point. The formula (21) would require a constant equal to 0.000757 to satisfy best these experiments. It would seem, therefore, according to these, that the coefficient of τ^1 should be greater even than that in (9), which is also greater than the theoretical value in (10), which has been adopted in constructing the tables. On account of the fewness of the experiments, however, and the inconveniences under which they were made, the results are not decisive, and the whole subject requires further research. In the ten experiments, 392 to 401, inclusive, made in a heated room on Pike's Peak at a much higher temperature, it is seen from the residuals $\theta—C$ in the tables of section 6, that the experiments are very well satisfied by the tables, but the residuals, though very small, are all negative, as in the preceding table, indicating that a little greater coefficient of τ_1 in (20), or of $\tau—\tau_1$ in (21) is required. For ordinary ranges of temperature, however, the whole uncertainty is a matter of no consequence in any practical application of the formula and tables.

23. A number of experiments were made to ascertain how long it is necessary to sling the psychrometer with a velocity of 25 feet per second in order to reach the maximum temperature depression $\tau—\tau_1$ of the wet bulb, and also to ascertain how long it would be necessary to continue to sling it before this would begin to decrease in consequence of the wet bulb's becoming too dry. From the average of nine sets of experiments, in which the wet bulb was first wet with water of the same temperature as the air, and the psychrometer was whirled for ten seconds and then read, then whirled ten seconds longer and read again, and so on, we get the results in the following table in degrees Fahrenheit:

No. of reading.	τ	τ_1	$\tau-\tau_1$	No. of reading.	τ	τ_1	$\tau-\tau_1$
	°	°	°		°	°	°
1	55.10	47.44	7.66	13	55.08	45.01	10.07
2	55.16	45.73	9.43	14	55.08	45.07	10.01
3	55.18	45.30	9.88	15	55.17	45.21	9.96
4	55.13	45.18	9.95	16	55.10	45.28	9.82
5	55.17	45.12	10.05	17	55.09	45.37	9.72
6	55.20	45.13	10.07	18	55.20	45.72	9.48
7	55.18	45.06	10.12	19	55.21	45.97	9.24
8	55.18	45.08	10.10	20	55.17	46.67	8.50
9	55.13	45.09	10.04	21	55.18	47.76	7.52
10	55.16	45.12	10.04	22	55.23	48.66	6.57
11	55.18	45.14	10.04	23	55.20	49.83	5.37
12	55.23	45.18	10.05				

The maximum of $\tau—\tau^1$ is reached at about the seventh reading or at the end of a little more than one minute of whirling, or we may say at the end of one minute of continuous whirling, since in the stoppages to read the temperatures there would be meanwhile a slight rise of temperature. With a velocity of whirling, however, of only 10 feet per second the time required to reach the maximum depression would be, perhaps, two or three minutes. Although the maximum depression, as we have seen, section 14, is reached with a velocity of 10 feet per second, especially in the case of small cylindrical bulbs, yet there is an advantage of having a greater velocity, in that it requires less whirling to reach this maximum.

At the end of about 2.5 minutes of whirling at the rate of 25 feet per second, the value of $\tau—\tau_1$ begins to diminish from the effect of the muslin of the wet bulb becoming too dry. Whirling, therefore, at this rate should not be continued beyond this time,

but with smaller velocities of whirling it may, of course, be continued longer, since the smaller the velocity the less the rate with which the muslin dries. This time must depend very much upon the kind of muslin used, coarse or fine, and also upon the kind of bulb. Every observer or experimenter should determine this for the psychrometer in use and not continue to swing or whirl before reading until the bulb becomes too dry.

24. The psychrometric formula (21), expressed in English measures, becomes:

$$(24) \qquad p=p_1-0.000367\,P(\tau-\tau_1)\,(1+0.00064)\,(\tau-\tau_1)$$

This, reduced to tables in the manner in which (21) has been, gives Tables I and II instead of Tables IV and V in international measures. Hence we now have, instead of (23),

$$(25) \qquad p=\text{Table I}-\text{Table II}.$$

Using now Table I in an inverse manner, the value of τ corresponding to this value of p found in the interior of the table, is dew-point δ.

With the air temperature τ and the dew-point δ, we get the depression of the dew-point $(\tau-\delta)$. Then with τ and $(\tau-\delta)$ as arguments, Table III gives the relative humidity, R.

Example.—Given $\tau=84.3$ $\tau_1=66°.7$, and $P=25.3$ inches to find p δ and R.

Table I, with $\tau=\tau_1=66°.70$ as an argument, gives $p_1=0.654$ inch.

Table II, with $\tau-\tau_1=84°.3-66°.7=17°.6$ and $p=25.5$ inches (the nearest argument in the table to 25.3 inches) as arguments, gives 0.167 inch as the value of the last term in (24). Hence by (25) we get

$$p=0.654-0.167=0.487 \text{ inch.}$$

The value of τ, Table I, corresponding with 0.487 inch in the table, is the dew-point $\delta=58°.3$.

Table III, with $\tau=84°.3$ and $\tau-\delta=84°.3-58°.3=26°.0$ as arguments, then gives 42°.

TABLE I.—*Tension of aqueous vapor.*

τ	0°	1°	2°	3°	4°	5°	6°	7°	8°	9°
°	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*
−30	0.010	0.009	0.009	0.008	0.008	0.007	0.007	0.007	0.006	0.006
−20	0.017	0.016	0.015	0.014	0.014	0.013	0.012	0.011	0.011	0.010
−10	0.028	0.026	0.025	0.024	0.023	0.022	0.020	0.019	0.018	0.018
− 0	0.045	0.043	0.041	0.039	0.037	0.035	0.034	0.032	0.031	0.029
+ 0	0.045	0.047	0.049	0.052	0.054	0.057	0.059	0.062	0.065	0.068
10	0.071	0.074	0.078	0.081	0.085	0.088	0.092	0.096	0.101	0.105
20	0.110	0.114	0.119	0.124	0.130	0.136	0.141	0.147	0.153	0.159

τ	0°.0	0°.1	0°.2	0°.3	0°.4	0°.5	0°.6	0°.7	0°.8	0°.9
30	0.166	0.167	0.167	0.168	0.169	0.169	0.170	0.171	0.171	0.172
31	0.173	0.173	0.174	0.175	0.176	0.176	0.177	0.178	0.178	0.179
32	0.180	0.181	0.181	0.182	0.183	0.184	0.184	0.185	0.186	0.186
33	0.187	0.188	0.189	0.189	0.190	0.191	0.192	0.192	0.193	0.194
34	0.195	0.196	0.196	0.197	0.198	0.199	0.200	0.200	0.201	0.202
35	0.203	0.204	0.204	0.205	0.206	0.207	0.208	0.208	0.209	0.210
36	0.211	0.212	0.213	0.213	0.214	0.215	0.216	0.217	0.218	0.218
37	0.219	0.220	0.221	0.222	0.223	0.224	0.225	0.225	0.226	0.227
38	0.228	0.229	0.230	0.231	0.232	0.233	0.233	0.234	0.235	0.236
39	0.237	0.238	0.239	0.240	0.241	0.242	0.243	0.244	0.245	0.246
40	0.246	0.247	0.248	0.249	0.250	0.251	0.252	0.253	0.254	0.255
41	0.256	0.257	0.258	0.259	0.260	0.261	0.262	0.263	0.264	0.265
42	0.266	0.267	0.268	0.269	0.270	0.271	0.272	0.273	0.274	0.276
43	0.277	0.278	0.279	0.280	0.281	0.282	0.283	0.284	0.285	0.286
44	0.287	0.288	0.290	0.291	0.292	0.293	0.294	0.295	0.296	0.297
45	0.298	0.300	0.301	0.302	0.303	0.304	0.305	0.306	0.308	0.309
46	0.310	0.311	0.312	0.313	0.315	0.316	0.317	0.318	0.319	0.321
47	0.322	0.323	0.324	0.325	0.327	0.328	0.329	0.330	0.332	0.333
48	0.334	0.335	0.337	0.338	0.339	0.340	0.342	0.343	0.344	0.345
49	0.317	0.348	0.349	0.351	0.352	0.353	0.355	0.356	0.357	0.359
50	0.360	0.361	0.363	0.364	0.365	0.367	0.368	0.369	0.371	0.372
51	0.373	0.375	0.376	0.378	0.379	0.380	0.382	0.383	0.385	0.386
52	0.387	0.389	0.390	0.392	0.393	0.395	0.396	0.397	0.399	0.400
53	0.402	0.403	0.405	0.406	0.408	0.409	0.411	0.412	0.414	0.415
54	0.417	0.418	0.420	0.421	0.423	0.424	0.426	0.427	0.429	0.421

TABLE I.—*Tension of aqueous vapor*—Continued.

τ	0°.0	0°.1	0°.2	0°.3	0°.4	0°.5	0°.6	0°.7	0°.8	0°.9
°	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*
+55	0.433	0.434	0.435	0.437	0.438	0.440	5.442	0.443	0.445	0.446
56	0.448	0.450	0.451	0.453	0.455	0.456	0.458	0.460	0.461	0.463
57	0.464	0.466	0.468	0.470	0.471	0.473	0.475	0.476	0.478	0.480
58	0.481	0.483	0.485	0.487	0.488	0.490	0.492	0.494	0.495	0.497
59	0.499	0.501	0.503	0.504	0.506	0.508	0.510	0.512	0.513	0.515
60	0.517	0.519	0.521	0.523	0.524	0.526	0.528	0.530	0.532	0.534
61	0.536	0.538	0.539	0.541	0.543	0.545	0.547	0.549	0.551	0.553
62	0.555	0.557	0.559	0.561	0.563	0.565	0.567	0.569	0.571	0.573
63	0.575	0.577	0.579	0.581	0.583	0.585	0.587	0.589	0.591	0.593
64	0.595	0.597	0.599	0.601	0.604	0.606	0.608	0.610	0.612	0.614
65	0.616	0.618	0.621	0.623	0.625	0.627	0.629	0.631	0.634	0.636
66	0.638	0.640	0.642	0.645	0.647	0.649	0.651	0.654	0.656	0.658
67	0.660	0.663	0.665	0.667	0.670	0.671	0.674	0.677	0.679	0.681
68	0.684	0.686	0.688	0.691	0.693	0.695	0.698	0.700	0.703	0.705
69	0.707	0.710	0.712	0.715	0.717	0.720	0.722	0.724	0.727	0.730
70	0.732	0.734	0.737	0.740	0.742	0.745	0.747	0.750	0.752	0.754
71	0.757	0.760	0.762	0.765	0.768	0.770	0.773	0.775	0.778	0.781
72	0.783	0.786	0.789	0.791	0.794	0.797	0.799	0.802	0.805	0.807
73	0.810	0.813	0.816	0.818	0.821	0.824	0.827	0.829	0.832	0.835
74	0.838	0.841	0.844	0.846	0.849	0.852	0.855	0.858	0.861	0.864
75	0.866	0.869	0.872	0.875	0.878	0.881	0.884	0.887	0.890	0.893
76	0.896	0.899	0.902	0.905	0.908	0.911	0.914	0.917	0.920	0.923
77	0.926	0.929	0.932	0.935	0.938	0.941	0.944	0.948	0.951	0.954
78	0.957	0.960	0.963	0.967	0.970	0.973	0.976	0.979	0.983	0.986
79	0.989	0.992	0.996	0.999	1.002	1.105	1.009	1.012	1.015	1.019
80	1.022	1.025	1.029	1.032	1.035	1.039	1.042	1.046	1.049	1.052
81	1.056	1.059	1.063	1.066	1.070	1.073	1.077	1.080	1.084	1.087
82	1.091	1.094	1.098	1.101	1.105	1.109	1.112	1.116	1.119	1.123
83	1.127	1.130	1.134	1.138	1.141	1.145	1.149	1.152	1.156	1.160
84	1.163	1.167	1.171	1.175	1.179	1.182	1.186	1.190	1.194	1.198
85	1.202	1.205	1.209	1.213	1.217	1.221	1.225	1.229	1.233	1.237
86	1.241	1.245	1.249	1.253	1.256	1.260	1.265	1.269	1.273	1.277
87	1.281	1.285	1.289	1.293	1.297	1.301	1.305	1.310	1.314	1.318
88	1.322	1.326	1.330	1.335	1.339	1.343	1.347	1.352	1.356	1.360
89	1.364	1.369	1.373	1.377	1.382	1.386	1.391	1.395	1.399	1.404
90	1.408	1.413	1.417	1.421	1.426	1.430	1.435	1.439	1.444	1.448
91	1.453	1.458	1.462	1.467	1.471	1.476	1.481	1.485	1.490	1.494
92	1.499	1.504	1.508	1.513	1.518	1.523	1.527	1.532	1.537	1.542
93	1.546	1.551	1.556	1.561	1.566	1.571	1.575	1.580	1.585	1.590
94	1.595	1.600	1.605	1.610	1.615	1.620	1.625	1.630	1.635	1.640
95	1.645	1.650	1.655	1.660	1.665	1.671	1.676	1.681	1.686	1.691
96	1.696	1.702	1.707	1.712	1.717	1.723	1.728	1.733	1.739	1.744
97	1.749	1.755	1.760	1.765	1.770	1.776	1.782	1.787	1.792	1.798
98	1.803	1.809	1.814	1.820	1.825	1.831	1.837	1.842	1.848	1.853
99	1.859	1.865	1.870	1.876	1.882	1.887	1.893	1.899	1.905	1.910
100	1.916	1.922	1.928	1.934	1.939	1.945	1.951	1.957	1.963	1.969
101	1.975	1.981	1.987	1.993	1.999	2.005	2.011	2.017	2.023	2.029
102	2.035	2.041	2.047	2.053	2.059	2.066	2.072	2.078	2.084	2.090
103	2.097	2.103	2.109	2.116	2.122	2.128	2.135	2.141	2.147	2.154
104	2.160	2.166	2.173	2.179	2.186	2.192	2.199	2.205	2.212	2.219
105	2.225	2.232	2.238	2.245	2.252	2.258	2.265	2.272	2.278	2.285
106	2.292	2.299	2.305	2.312	2.319	2.326	2.333	2.340	2.347	2.353
107	2.360	2.367	2.374	2.381	2.388	2.395	2.402	2.409	2.416	2.423
108	2.431	2.438	2.445	2.452	2.459	2.466	2.474	2.481	2.488	2.495
109	2.503	2.510	2.517	2.525	2.532	2.539	2.547	2.554	2.562	2.569
110	2.576	2.584	2.591	2.599	2.607	2.614	2.622	2.629	2.637	2.645
111	2.652	2.660	2.668	2.675	2.683	2.691	2.699	2.706	2.714	2.722
112	2.730	2.738	2.746	2.754	2.762	2.769	2.777	2.785	2.793	2.801
113	2.810	2.818	2.826	2.834	2.842	2.850	2.858	2.866	2.875	2.883
114	2.891	2.899	2.908	2.916	2.924	2.933	2.941	2.950	2.958	2.966
115	2.975	2.983	2.992	3.000	3.009	3.017	3.026	3.035	3.043	3.052
116	3.061	3.069	3.078	3.087	3.096	3.104	3.113	3.122	3.131	3.140
117	3.149	3.157	3.166	3.175	3.184	3.193	3.202	3.211	3.220	3.229
118	3.239	3.248	3.257	3.266	3.275	3.284	3.294	3.303	3.312	3.321
119	3.331	3.340	3.350	3.359	3.368	3.378	3.387	3.397	3.406	3.416

TABLE II.—*Values of* $0.000367\,P\,(\tau-\tau_1)\left(1+\frac{\tau-\tau_1}{1571}\right)$.

[Arguments: $\tau-\tau_1$ and P.]

$\tau-\tau_1$	Barometric pressure P in inches.												
	30.5	30.0	29.5	29.0	28.5	28.0	27.5	27.0	26.5	26.0	25.5	25.0	24.5
°	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*
1	.011	.011	.011	.011	.010	.010	.010	.010	.010	.010	.009	.009	.009
2	.022	.022	.022	.021	.021	.021	.020	.020	.019	.019	.019	.018	.018
3	.034	.033	.033	.032	.031	.031	.030	.030	.029	.029	.028	.027	.028
4	.045	.044	.043	.043	.042	.041	.040	.040	.039	.038	.038	.037	.036
5	.056	.055	.054	.053	.052	.052	.051	.050	.049	.048	.047	.046	.045
6	.067	.066	.065	.064	.063	.062	.061	.060	.059	.057	.056	.055	.054
7	.079	.077	.076	.075	.073	.072	.071	.070	.068	.067	.066	.064	.063
8	.090	.088	.087	.086	.084	.083	.081	.080	.078	.077	.075	.074	.072
9	.101	.099	.098	.096	.095	.093	.091	.090	.088	.086	.085	.083	.081
10	.113	.111	.109	.107	.105	.103	.102	.100	.098	.096	.094	.092	.090
11	.124	.122	.120	.118	.116	.114	.112	.110	.108	.106	.104	.102	.100
12	.135	.133	.131	.129	.126	.124	.122	.120	.118	.115	.113	.111	.109
13	.147	.144	.142	.140	.137	.135	.132	.130	.127	.125	.123	.120	.118
14	.158	.156	.153	.150	.148	.145	.143	.140	.137	.135	.132	.130	.127
15	.170	.167	.164	.161	.158	.156	.153	.150	.147	.144	.142	.139	.136
16	.181	.178	.175	.172	.169	.166	.163	.160	.157	.154	.151	.148	.145
17	.192	.189	.186	.183	.180	.177	.173	.170	.167	.164	.161	.158	.155
18	.204	.200	.197	.194	.190	.187	.184	.180	.177	.174	.170	.167	.164
19	.215	.212	.208	.205	.201	.198	.194	.191	.187	.183	.180	.176	.173
20	.227	.223	.219	.216	.212	.208	.204	.201	.197	.193	.190	.186	.182
21	.238	.234	.230	.226	.223	.219	.215	.211	.207	.203	.199	.195	.191
22	.250	.246	.242	.237	.233	.229	.225	.221	.217	.213	.209	.205	.201
23	.261	.257	.253	.248	.244	.240	.236	.231	.227	.223	.218	.214	.210
24	.273	.268	.264	.259	.255	.250	.246	.241	.237	.233	.228	.224	.219
25	.284	.280	.275	.270	.266	.261	.256	.252	.247	.242	.238	.233	.228
26	.296	.291	.286	.281	.277	.272	.267	.262	.257	.252	.247	.243	.238
27	.307	.302	.297	.292	.287	.282	.277	.272	.267	.262	.257	.252	.247
28	.319	.314	.309	.303	.298	.293	.288	.282	.277	.272	.267	.261	.256
29	.331	.325	.320	.314	.309	.304	.298	.293	.287	.282	.276	.271	.266
30	.342	.337	.331	.325	.320	.314	.309	.303	.297	.292	.286	.281	.275
31	.354	.348	.342	.336	.331	.325	.319	.313	.307	.302	.296	.290	.284
32	.365	.359	.354	.348	.342	.336	.330	.324	.318	.312	.306	.300	.294
33	.377	.371	.365	.359	.352	.346	.340	.334	.328	.322	.315	.309	.303
34	.389	.382	.376	.370	.363	.357	.351	.344	.338	.331	.325	.319	.312
35	.401	.394	.387	.381	.374	.368	.361	.355	.348	.341	.335	.328	.322
36	.412	.405	.399	.392	.385	.378	.372	.365	.358	.351	.345	.338	.331
37	.424	.417	.410	.403	.396	.389	.382	.375	.368	.361	.354	.347	.341
38	.436	.428	.421	.414	.407	.400	.393	.386	.379	.371	.364	.357	.350
39	.447	.440	.433	.425	.418	.411	.403	.396	.389	.381	.374	.367	.359
40	.459	.452	.444	.437	.429	.422	.414	.406	.399	.391	.384	.376	.369

TABLE II.—Continued.

$\tau - \tau_1$	Barometric pressure P in inches.												
	24.0	23.5	23.0	22.5	22.0	21.5	21.0	20.5	20.0	19.5	19.0	18.5	18.0
°	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*
1	.009	.009	.008	.008	.008	.008	.008	.008	.007	.007	.007	.007	.007
2	.018	.017	.017	.017	.016	.016	.015	.015	.015	.014	.014	.014	.013
3	.026	.026	.025	.025	.024	.024	.023	.023	.022	.021	.021	.020	.020
4	.035	.035	.034	.033	.032	.032	.031	.030	.029	.029	.028	.027	.026
5	.044	.043	.042	.041	.040	.040	.039	.038	.037	.036	.035	.034	.033
6	.053	.052	.051	.050	.049	.048	.046	.045	.044	.043	.042	.041	.040
7	.062	.061	.059	.058	.057	.055	.054	.053	.052	.050	.049	.048	.046
8	.071	.069	.068	.066	.065	.063	.062	.060	.059	.057	.056	.055	.053
9	.080	.078	.076	.075	.073	.071	.070	.068	.066	.064	.063	.061	.060
10	.089	.087	.085	.083	.081	.079	.078	.076	.074	.072	.070	.068	.066
11	.098	.096	.094	.091	.089	.087	.085	.083	.081	.079	.077	.075	.073
12	.107	.104	.102	.100	.098	.095	.093	.091	.089	.086	.084	.082	.080
13	.115	.113	.111	.108	.106	.103	.101	.099	.096	.093	.091	.089	.086
14	.124	.122	.119	.117	.114	.111	.109	.106	.104	.101	.098	.095	.093
15	.133	.131	.128	.125	.122	.119	.117	.114	.111	.108	.105	.102	.100
16	.142	.139	.136	.133	.130	.128	.125	.122	.119	.116	.113	.110	.104
17	.151	.148	.145	.142	.139	.136	.132	.129	.126	.123	.120	.117	.117
18	.160	.157	.154	.150	.149	.144	.140	.137	.134	.130	.127	.124	.123
19	.169	.166	.162	.159	.155	.152	.148	.145	.141	.137	.134	.131	.120
20	.178	.175	.171	.167	.164	.160	.156	.152	.149	.144	.141	.137	.137
21	.187	.184	.180	.176	.172	.168	.164	.160	.156	.152	.148	.144	.141
22	.196	.192	.188	.184	.180	.176	.172	.168	.164	.160	.156	.151	.147
23	.206	.201	.197	.193	.188	.184	.180	.176	.171	.167	.163	.158	.154
24	.215	.210	.206	.201	.197	.192	.188	.183	.179	.174	.170	.165	.161
25	.224	.219	.214	.210	.205	.200	.196	.191	.186	.182	.177	.172	.168
26	.233	.228	.223	.218	.213	.209	.204	.199	.194	.189	.184	.179	.175
27	.242	.237	.232	.227	.222	.217	.212	.207	.202	.197	.192	.186	.181
28	.251	.246	.241	.235	.230	.225	.220	.214	.209	.204	.199	.193	.188
29	.260	.255	.249	.244	.238	.233	.228	.222	.217	.211	.206	.201	.195
30	.269	.264	.258	.252	.247	.241	.236	.230	.224	.219	.213	.208	.202
31	.278	.273	.267	.261	.255	.249	.244	.238	.232	.226	.220	.215	.209
32	.288	.282	.276	.270	.264	.258	.252	.246	.240	.234	.228	.222	.216
33	.297	.291	.284	.278	.272	.266	.260	.253	.247	.241	.235	.229	.223
34	.306	.300	.293	.287	.280	.274	.268	.261	.255	.249	.242	.236	.229
35	.315	.309	.302	.295	.289	.282	.276	.269	.263	.256	.249	.243	.236
36	.324	.318	.311	.304	.297	.291	.284	.277	.270	.264	.257	.250	.243
37	.334	.327	.320	.313	.306	.299	.292	.285	.278	.271	.264	.257	.250
38	.343	.336	.329	.321	.314	.307	.300	.293	.286	.279	.271	.264	.257
39	.352	.345	.337	.330	.323	.315	.308	.301	.293	.286	.279	.271	.264
40	.361	.354	.346	.339	.331	.324	.316	.309	.301	.294	.286	.278	.271

TABLE III.—*Relative humidity.*

[Expressed in hundredths.]

Air temp. τ	Depression of dew-point ($\tau-\delta$) 0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
−36	100	94	87	82	77											
−32	100	94	88	83	79	74	69	65	61							
−28	100	94	89	84	80	75	71	67	63	59	55	52	48			
−24	100	95	90	85	80	76	72	68	64	60	57	53	50	47	44	41
−20	100	95	90	85	80	76	72	68	64	61	57	53	51	48	46	43
−16	100	95	90	86	81	77	73	69	65	62	58	55	52	49	47	44
−12	100	95	90	86	82	78	74	70	66	63	60	57	54	50	48	45
−8	100	95	91	86	82	78	74	71	67	64	61	58	55	52	49	47
−4	100	95	91	87	83	79	75	71	68	65	62	58	56	53	50	48
0	100	96	91	87	83	79	75	72	69	65	62	59	56	54	51	49
+4	100	96	92	88	84	80	76	72	69	66	63	60	57	55	52	50
8	100	96	92	88	84	80	76	73	70	66	63	61	58	55	53	50
12	100	96	92	88	84	80	76	73	70	67	64	61	58	55	53	51
16	100	96	92	88	84	80	76	73	70	67	64	61	59	56	54	51
20	100	96	92	88	84	81	77	74	71	68	65	62	59	56	54	52
+24	100	96	92	88	84	81	77	74	71	68	65	62	60	57	55	52
28	100	96	92	88	85	81	78	75	72	68	65	62	60	57	55	53
32	100	96	92	89	85	82	79	75	72	69	66	63	61	58	56	54
36	100	96	93	89	85	82	79	76	73	69	66	64	62	59	57	54
40	100	96	93	89	85	82	79	76	73	70	67	64	62	59	57	55
+44	100	96	93	89	86	83	79	76	73	71	68	65	63	60	58	55
48	100	96	93	89	86	83	80	77	74	71	68	66	63	61	58	56
52	100	96	93	89	86	83	80	77	74	71	69	66	94	61	59	57
56	100	96	93	90	86	83	80	77	75	72	69	67	64	62	60	57
60	100	96	93	90	87	84	81	78	75	72	70	67	65	62	60	58
+64	100	97	93	90	87	84	81	78	75	73	70	68	65	63	61	58
68	100	97	93	90	87	84	81	78	76	73	71	68	66	63	61	59
72	100	97	93	90	87	84	82	79	76	73	71	68	66	64	61	59
76	100	97	94	90	87	85	82	79	76	74	71	69	67	64	62	60
80	100	97	94	90	88	85	82	79	77	74	72	69	67	65	62	60
+84	100	97	94	91	88	85	82	80	77	74	72	70	67	65	63	61
88	100	97	94	91	88	85	83	80	77	75	72	70	68	66	63	61
92	100	97	94	91	88	85	83	80	78	75	73	70	68	66	64	63
96	100	97	94	91	88	86	83	80	78	75	73	71	69	66	64	63
100	100	97	94	91	88	86	83	81	78	76	73	71	69	67	65	63
+104	100	97	94	91	89	86	83	81	78	76	74	71	69	67	65	63
108	100	97	94	92	89	86	84	81	79	76	74	72	70	68	66	64
112	100	97	94	92	89	86	84	82	79	77	74	72	70	68	66	64
116	100	97	94	92	89	87	84	82	79	77	75	73	71	68	66	64
120	100	97	95	92	89	87	85	82	80	77	75	73	71	69	67	65

TABLE III.—*Relative humidity.*—Continued.

Air temp. τ	Depression of the dew-point ($\tau - \delta$).															
	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
−24	41	38														
−20	43	40	38	36	34	32										
−16	44	41	40	37	35	33	31	29	27	25						
−12	45	42	40	38	36	34	32	30	28	27	25	24	22	21		
−8	47	44	41	39	37	35	33	31	29	28	26	25	23	22	20	19
−4	48	45	43	41	38	36	34	32	31	29	27	26	24	23	21	20
0	49	46	44	42	39	37	35	34	32	30	29	27	25	24	23	21
+4	50	47	45	43	40	38	36	35	33	31	30	28	27	25	24	22
8	50	48	45	43	41	39	37	35	34	32	30	29	28	26	25	23
12	51	48	46	44	42	40	38	36	34	32	31	29	28	26	25	23
16	51	49	46	44	42	40	39	37	35	33	31	30	29	27	26	24
20	52	49	47	45	43	41	39	37	36	34	32	31	30	28	26	25
+24	52	50	47	45	43	42	40	38	36	35	33	32	30	29	27	25
28	53	51	48	46	44	42	40	38	37	35	33	32	31	29	28	26
32	54	51	49	47	45	43	41	39	37	36	34	33	31	30	28	27
36	54	52	50	48	46	44	42	40	38	37	35	34	32	31	29	28
40	55	53	50	48	47	45	43	41	39	38	35	35	33	32	30	29
+44	55	53	51	49	47	45	43	42	40	38	36	35	33	32	30	29
48	56	54	52	50	48	46	44	42	40	39	37	36	34	33	31	30
52	57	54	52	50	48	46	44	43	41	40	38	37	35	34	32	31
56	57	55	53	51	49	47	45	44	42	40	39	37	35	34	33	32
60	58	56	54	52	50	48	46	44	43	41	39	38	36	35	33	32
+64	58	56	54	52	50	48	47	45	43	42	40	39	37	36	34	33
68	59	57	55	53	51	49	47	45	44	42	40	39	37	36	34	33
72	59	57	55	53	52	49	48	46	44	43	41	40	38	37	35	34
76	60	58	56	54	52	50	48	47	45	43	42	40	39	37	36	35
80	60	58	56	54	52	51	49	47	45	44	42	41	39	38	36	35
+84	61	59	57	55	53	51	49	48	46	44	43	42	40	39	37	36
88	61	59	57	55	53	52	50	48	47	45	43	42	40	39	37	36
92	62	60	58	56	54	52	50	49	47	46	44	43	41	40	38	37
96	62	60	58	56	55	53	51	49	48	46	45	44	42	40	39	38
100	63	61	59	57	55	53	52	50	48	47	45	44	42	41	39	38
104	63	61	59	57	56	54	53	51	49	47	46	45	43	41	40	39
108	64	62	60	58	56	54	53	51	49	48	46	45	43	42	40	39
112	64	62	60	58	57	55	54	52	50	48	47	46	44	43	41	40
116	64	63	61	60	57	55	54	52	50	49	48	47	45	43	42	41
120	65	63	61	59	58	56	54	52	51	50	48	47	45	44	42	41

TABLE III.—*Relative humidity*—Continued.

Air temp. τ	Depression of dew-point ($\tau - \Delta$).															
	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72	75
− 8	19															
− 4	20	17	14													
0	21	18	15	13												
+ 4	22	19	16	14	12	10										
8	23	19	16	14	12	10	8									
12	23	20	17	15	13	11	9	7								
16	24	21	18	16	13	11	9	8	7	6						
20	25	22	19	16	14	12	10	8	7	6	5					
+ 24	25	22	19	16	14	12	10	9	7	6	5	4				
28	26	23	20	17	15	13	11	9	8	7	6	5	4			
32	27	24	21	18	16	14	12	10	8	7	6	5	4	3	3	
36	28	24	21	18	16	14	12	10	9	7	6	5	4	4	3	3
40	29	25	22	19	17	15	13	11	9	7	6	5	4	4	3	3
+ 44	29	26	23	20	17	15	13	11	9	8	7	6	5	5	4	3
48	30	26	23	20	18	16	14	12	10	8	7	6	5	5	4	3
52	31	27	24	21	18	16	14	12	10	9	8	7	6	5	4	4
56	32	28	24	21	19	17	15	13	11	9	8	7	6	5	4	4
60	32	28	25	22	19	17	15	13	11	10	9	8	7	6	5	4
+ 64	33	29	26	23	20	18	16	14	12	10	9	8	7	6	5	4
68	33	29	26	23	20	18	16	14	12	11	10	8	7	6	5	5
72	34	30	27	24	21	19	17	15	13	11	10	8	7	6	6	5
76	35	31	28	25	22	19	17	15	13	11	10	9	8	7	6	6
80	35	31	28	25	23	20	18	16	14	12	11	9	8	7	6	6
+ 84	36	32	29	26	23	20	18	16	14	12	11	9	8	7	6	6
88	36	32	29	26	24	21	19	17	15	13	12	10	8	8	7	7
92	37	33	30	27	24	21	19	17	15	13	12	10	8	8	7	7
96	38	34	30	27	24	22	20	18	16	14	13	11	9	8	8	7
100	38	34	31	28	25	22	20	18	16	14	13	11	9	8	8	7
+104	30	35	32	29	26	23	21	19	17	15	13	11	10	9	8	7
108	39	35	32	29	26	23	21	19	17	15	14	12	11	10	9	8
112	40	36	33	30	27	24	22	20	18	16	14	12	11	10	9	8
116	41	37	33	30	27	24	22	20	18	16	15	13	11	10	9	8
120	41	37	34	31	28	25	23	21	19	17	15	13	12	11	10	9

TABLE IV.—*Tension of aqueous vapor in millimeters.*

τ	0°	1°	2°	3°	4°	5°	6°	7°	8°	9°
°										
−30	0.38	0.35	0.32	0.29	0.26	0.23	0.21	0.19	0.17	0.15
−20	0.94	0.87	0.79	0.73	0.66	0.61	0.55	0.50	0.46	0.42
−10	2.15	1.99	1.84	1.69	1.56	1.44	1.32	1.22	1.12	1.03
− 0	4.57	4.25	3.95	3.67	3.41	3.16	2.93	2.72	2.51	2.33

	0°.0	0°.1	0°.2	0°.3	0°.4	0°.5	0°.6	0°.7	0°.8	0°.9
0	4.57	4.60	4.63	4.67	4.70	4.74	4.77	4.80	4.84	4.87
1	4.91	4.94	4.98	5.02	5.05	5.09	5.12	5.16	5.20	5.23
2	5.27	5.31	5.35	5.39	5.42	5.46	5.50	5.54	5.58	5.62
3	5.66	5.70	5.74	5.78	5.82	5.86	5.90	5.94	5.98	6.03
4	6.07	6.11	6.15	6.20	6.24	6.28	6.33	6.37	6.42	6.46
5	6.51	6.55	6.60	6.64	6.69	6.74	6.78	6.83	6.88	6.92
6	6.97	7.02	7.07	7.12	7.17	7.21	7.26	7.31	7.36	7.42
7	7.47	7.52	7.57	7.62	7.67	7.72	7.78	7.83	7.88	7.94
8	7.99	8.05	8.10	8.15	8.21	8.27	8.32	8.38	8.43	8.49
9	8.55	8.61	8.66	8.72	8.78	8.84	8.90	8.96	9.02	9.08
10	9.14	9.20	9.26	9.32	9.39	9.45	9.51	9.57	9.64	9.70
11	9.77	9.83	9.90	9.96	10.03	10.09	10.16	10.23	10.30	10.36
12	10.43	10.50	10.57	10.64	10.71	10.78	10.85	10.92	10.99	11.06
13	11.14	11.21	11.28	11.36	11.43	11.50	11.58	11.65	11.73	11.81
14	11.88	12.96	12.04	12.12	12.19	12.27	12.35	12.43	12.51	12.59
15	12.67	12.76	12.84	12.92	13.00	13.09	13.17	13.25	13.34	13.42
16	13.51	13.60	13.68	13.77	13.86	13.95	14.04	14.12	14.21	14.30
17	14.39	14.49	14.58	14.67	14.76	14.86	14.95	15.04	15.14	15.23
18	15.33	15.43	15.52	15.62	15.72	15.82	15.92	16.02	16.12	16.22
19	16.32	16.42	16.52	16.63	16.73	16.83	16.94	17.04	17.15	17.25
20	17.36	17.47	17.58	17.69	17.80	17.91	18.02	18.13	18.24	18.35
21	18.47	18.58	18.69	18.81	18.92	19.04	19.16	19.27	19.39	19.51
22	19.63	19.75	19.87	19.99	20.11	20.24	20.36	20.48	20.61	20.73
23	20.86	20.98	21.11	21.24	21.37	21.50	21.63	21.76	21.89	22.02
24	22.15	22.29	22.42	22.55	22.69	22.83	22.96	23.10	23.24	23.38
25	23.52	23.66	23.80	23.94	24.08	24.23	24.37	24.52	24.66	24.81
26	24.96	25.10	25.25	25.40	25.55	25.70	25.86	26.01	26.16	26.32
27	26.47	26.63	26.78	26.94	27.10	27.26	27.42	27.58	27.74	27.90
28	28.07	28.23	28.39	28.56	28.73	28.89	29.06	29.23	29.40	29.57
29	29.74	29.92	30.09	30.26	30.44	30.62	30.79	30.97	31.15	31.33
30	31.51	31.69	31.87	32.06	32.24	32.43	32.61	32.80	32.99	33.18
31	33.37	33.56	33.75	33.94	34.44	34.33	34.53	34.72	34.92	35.12
32	35.32	35.52	35.72	35.92	36.13	36.33	36.54	36.74	36.95	37.16
33	37.37	37.58	37.79	38.00	38.22	38.43	38.65	38.87	39.08	39.30
34	39.52	39.74	39.97	40.19	40.41	40.64	40.87	41.09	41.32	41.55
35	41.78	42.02	42.25	42.48	42.72	42.96	43.19	43,43	43.67	43.92
36	44.16	44.40	44.65	44.89	45.14	45.39	45.64	45.89	46.14	46.39
37	46.65	46.90	47.16	47.42	47.68	47.94	48.20	48.46	48.73	48.99
38	49.26	49.53	49.80	50.07	50.34	50.61	50.89	51.16	51.44	51.72
39	52.00	52.28	52.56	52.84	53.13	53.41	53.70	53.99	54.28	54.57
40	54.87	55.16	55 45	55.75	56.05	56.35	56.65	56.95	57.26	57.56
41	57.87	58.18	58.49	58.80	59.11	59.43	59.74	60.06	60.38	60.70
42	61.02	61.34	61.66	61.99	62.32	62.64	62.98	63.31	63.64	63.97
43	64.31	64.65	64.99	65.33	65.67	66.01	66.36	66.71	67.05	67.40
44	67.76	68.11	68.46	68.82	69.18	69.54	69.90	70.26	70.63	70.99

TABLE V.—*Values of* $0.000660\ P\ (\tau-\tau_1)\left(1+\frac{\tau-\tau_1}{873}\right)$

[Arguments: $(\tau-\tau_1)$ and P.]

$\tau-\tau_1$	Barometric pressure, P, in millimeters.															
	770	760	750	740	730	720	710	700	690	680	670	660	650	640	630	620
0																
1	0.52	0.51	0.50	0.50	0.49	0.48	0.48	0.47	0.46	0.46	0.45	0.44	0.44	0.43	0.42	0.42
2	1.03	1.01	1.00	0.98	0.97	0.96	0.94	0.93	0.92	0.90	0.89	0.88	0.87	0.85	0.84	0.82
3	1.54	1.52	1.49	1.47	1.45	1.43	1.41	1.39	1.37	1.35	1.33	1.32	1.30	1.28	1.26	1.24
4	2.04	2.02	1.99	1.97	1.94	1.91	1.89	1.86	1.83	1.81	1.78	1.75	1.73	1.70	1.67	1.65
5	2.56	2.52	2.49	2.46	2.43	2.39	2.36	2.32	2.29	2.26	2.23	2.19	2.17	2.13	2.09	2.06
6	3.07	3.03	2.99	2.95	2.91	2.87	2.83	2.79	2.75	2.71	2.67	2.63	2.59	2.55	2.51	2.47
7	3.59	3.54	3.50	3.45	3.40	3.36	3.31	3.26	3.22	3.17	3.12	3.08	3.04	2.99	2.94	2.89
8	4.11	4.05	4.00	3.95	3.89	3.84	3.79	3.73	3.68	3.63	3.58	3.53	3.48	3.42	3.36	3.31
9	4.63	4.56	4.50	4.44	4.38	4.32	4.27	4.21	4.15	4.09	4.03	3.97	3.91	3.85	3.79	3.73
10	5.15	5.08	5.01	4.94	4.88	4.81	4.74	4.68	4.61	4.54	4.47	4.41	4.35	4.28	4.21	4.14
11	5.66	5.59	5.51	5.44	5.37	5.30	5.22	5.15	5.08	5.00	4.93	4.86	4.79	4.71	4.63	4.56
12	6.19	6.11	6.02	5.94	5.86	5.78	5.70	5.62	5.54	5.46	5.38	5.30	5.22	5.14	5.06	4.98
13	6.71	6.62	6.53	6.45	6.36	6.27	6.18	6.10	6.01	5.92	5.83	5.75	5.66	5.57	5.49	5.40
14	7.23	7.14	7.05	6.95	6.86	6.76	6.67	6.58	6.48	6.39	6.29	6.20	6.11	6.01	5.92	5.83
15	7.76	7.66	7.56	7.46	7.36	7.26	7.16	7.06	6.95	6.85	6.75	6.65	6.55	6.45	6.35	6.25
16	8.29	8.18	8.07	7.96	7.86	7.75	7.64	7.54	7.43	7.32	7.21	7.11	7.00	6.89	6.78	6.68
17	8.82	8.70	8.59	8.47	8.36	8.24	8.13	8.02	7.90	7.79	7.67	7.56	7.45	7.33	7.21	7.10
18	9.35	9.22	9.10	8.98	8.86	8.74	8.62	8.50	8.37	8.25	8.13	8.01	7.89	7.77	7.65	7.52
19	9.87	9.75	9.62	9.49	9.36	9.23	9.11	8.98	8.85	8.72	8.59	8.47	8.34	8.21	8.08	7.95
20	10.41	10.27	10.14	10.00	9.87	9.73	9.60	9.46	9.32	9.19	9.05	8.92	8.78	8.65	8.51	8.38

$\tau-\tau_1$	Barometric pressure, P, in millimeters.															
	610	600	590	580	570	560	550	540	530	520	510	500	490	480	470	460
0																
1	0.41	0.40	0.40	0.39	0.38	0.38	0.37	0.36	0.36	0.35	0.34	0.34	0.33	0.32	0.31	0.31
2	0.81	0.80	0.78	0.77	0.76	0.75	0.73	0.72	0.70	0.69	0.68	0.67	0.65	0.64	0.62	0.61
3	1.22	1.20	1.17	1.15	1.13	1.12	1.10	1.08	1.06	1.04	1.02	1.00	0.98	0.96	0.94	0.92
4	1.62	1.60	1.57	1.54	1.51	1.49	1.46	1.44	1.41	1.38	1.36	1.33	1.30	1.28	1.25	1.22
5	2.03	1.99	1.96	1.93	1.90	1.86	1.83	1.80	1.76	1.73	1.70	1.66	1.63	1.60	1.56	1.53
6	2.43	2.39	2.35	2.32	2.28	2.24	2.20	2.16	2.12	2.08	2.04	2.00	1.96	1.92	1.87	1.83
7	2.84	2.80	2.75	2.71	2.66	2.61	2.56	2.52	2.47	2.43	2.38	2.33	2.28	2.24	2.19	2.14
8	3.26	3.20	3.15	3.10	3.04	2.99	2.94	2.88	2.83	2.78	2.72	2.67	2.62	2.56	2.51	2.45
9	3.67	3.61	3.55	3.49	3.43	3.37	3.31	3.25	3.19	3.13	3.06	3.00	2.94	2.88	2.82	2.76
10	4.07	4.01	3.94	3.88	3.81	3.74	3.67	3.61	3.54	3.48	3.41	3.34	3.27	3.21	3.14	3.07
11	4.49	4.42	4.34	4.27	4.19	4.12	4.05	3.97	3.90	3.83	3.75	3.68	3.60	3.53	3.46	3.38
12	4.90	4.82	4.74	4.66	4.58	4.50	4.42	4.34	4.26	4.18	4.10	4.02	3.93	3.85	3.78	3.70
13	5.31	5.23	5.14	5.05	4.96	4.88	4.79	4.70	4.62	4.53	4.44	4.36	4.27	4.18	4.09	4.01
14	5.73	5.64	5.54	5.45	5.35	5.26	5.17	5.07	4.98	4.88	4.79	4.70	4.60	4.51	4.42	4.32
15	6.15	6.05	5.95	5.85	5.74	5.64	5.54	5.44	5.34	5.24	5.14	5.04	4.94	4.84	4.74	4.64
16	6.57	6.46	6.35	6.24	6.14	6.03	5.92	5.81	5.71	5.60	5.49	5.38	5.27	5.17	5.06	4.95
17	6.98	6.87	6.75	6.64	6.53	6.41	6.30	6.18	6.07	5.95	5.84	5.72	5.61	5.50	5.38	5.27
18	7.40	7.28	7.16	7.04	6.92	6.80	6.67	6.55	6.43	6.31	6.19	6.07	5.95	5.83	5.70	5.58
19	7.82	7.70	7.57	7.44	7.31	7.18	7.05	6.93	6.80	6.67	6.54	6.42	6.29	6.16	6.03	5.90
20	8.24	8.11	7.97	7.84	7.70	7.57	7.43	7.30	7.16	7.03	6.90	6.76	6.62	6.49	6.35	6.22

APPENDIX 25.

REPORT OF JUNIOR PROFESSOR H. A. HAZEN, SIGNAL SERVICE, ON THUNDER-STORMS.

STUDY ROOM, SIGNAL OFFICE, *November* 11, 1885.

SIR: In accordance with your note upon my paper, entitled "Thunder-storms of 1884," I have carefully combined into mean maps the various charts in my former paper. The charts were originally intended to show that precisely the same effects were to be noted in different series as well as in a general mean, which frequently hides the very quantity we seek, but in the present instance there will be no loss by the condensation since it exhibits the same result as the individual maps. I have added tables which will enable any one who so chooses to project all the individual maps. I have had the paper rewritten, so that any one desiring to study the original manuscript and maps can do so.

Very respectfully,

H. A. HAZEN.

The CHIEF SIGNAL OFFICER OF THE ARMY.

THUNDER-STORMS OF 1884.

A systematic observation of thunder-storms in this country was begun by the Smithsonian Institution in 1849. These observations were kept up until 1873, when the work was given to the Signal Office, which had begun observations at its stations in 1871. In January, 1884, after a conference with the Postmaster-General, it was decided to undertake a more detailed study of these storms. The accompanying circular and card were sent to the post-offices 40 miles apart north of 35° north latitude and east of the one hundred and second meridian from Greenwich. For a still more detailed study, cards were sent to post-offices 10 miles apart in Illinois and Indiana, and within 150 miles in all directions from Washington.

[Circular No. 4.]

SIGNAL OFFICE, WAR DEPARTMENT,
Washington, March 1, 1884.

It is desired that during the summer of 1884 a few simple facts be collected relating to the important subject of thunder-storms. To this end post-offices and other centers have been selected, over a limited extent of country, at distances of about 10 miles. Each station, it will be readily seen, forms an important point in the net-work of stations, and by a comparison of these observations it is hoped that valuable acquisitions may be made to our knowledge of these frequent accompaniments of tornadoes. Each thunder-storm should have some note made of it, in order that there may be no gap in any region.

The following instructions are given for guidance in making observations. Each card will have sufficient space for five storms. Give town, county, State, time (whether "mountain," "central," "eastern," or some city), and name of observer.

Thunder-storms twelve hours apart may be taken as separate storms.

Upon the occurrence of thunder give, in the appropriate spaces, month and day, and, as near as possible, the time of first and last thunder connected with the storm. Frequently after a storm has passed there will be muttering of thunder, but care should be taken to, as far as may be, watch the single storm.

Give the direction from which the storm appears to be coming, as shown by threatening sky, lightning flashes, or thunder peals. Also, the direction towards which it goes.

Give time of beginning and ending of rain, with amount, if possible.

If the rain continues rather heavy more than two hours after the loudest thunder has passed, it may be marked "more than two hours."

The amount of rain can be measured, with a common rule, after it has been caught in a pail or empty tomato can with vertical sides.

All observations of hail, size of stones, &c., are very important.

Give directions and force of wind before and after the thunder-storm; for the force adopt the scale, calm, light, moderate, brisk, high, very high, hurricane or tornado.

If you have a thermometer, give the shade temperature, or temperature on the north side of house, a little before the storm reaches the station as well as after it has passed.

Note, also, if on any day heat-lightning is seen, the date, time of appearance, and direction.

If there is not time for a full report, give date and time of severest part of thunder-storm. Please do not fail to make some note of every distinct thunder-storm that passes over or within ear-shot of the station.

Observations should begin immediately upon the receipt of the cards.

Please return one of these cards on July 1 and another on September 1, even if there is no record other than town, county, State, and name.

This circular is issued with the sanction of the Postmaster-General.

If you know some one in your immediate neighborhood who takes an interest in meteorology and would be willing to report, you are at liberty to hand these cards to him.

W. B. HAZEN,
Brig. and Bvt. Maj. Gen'l, Chief Signal Officer, U. S. A.

[Form 169—1885.]

THUNDER-STORMS.

[Data collected by co-operation of Post-Office and War Departments.]

Town........................ County ....

State........................ Kind of time used........................

Date (month and day)					
Thunder	First heard				
	Loudest				
	Last heard				
Direction	Coming from				
	Going towards				
Rain	Began				
	Ended				
	Amount				
Hail	Began				
	Ended				
	Amount				
Wind	Before — Direction				
	Before — Force				
	After — Direction				
	After — Force				
Scale					

Distant lightning........................

Remarks........................

——— ———, *Observer.*

Only two cards left. Make ( ) cross.

Several interesting storms having occurrred in May, a paper was written upon them and presented to the American Association for the Advancement of Science, at its Philadelphia meeting in September, 1884; it was afterwards published as Signal Service Note No. XX. A further study of the records of separate storms for 1884, of which more than thirteen thousand were filed, has developed the facts presented herewith.

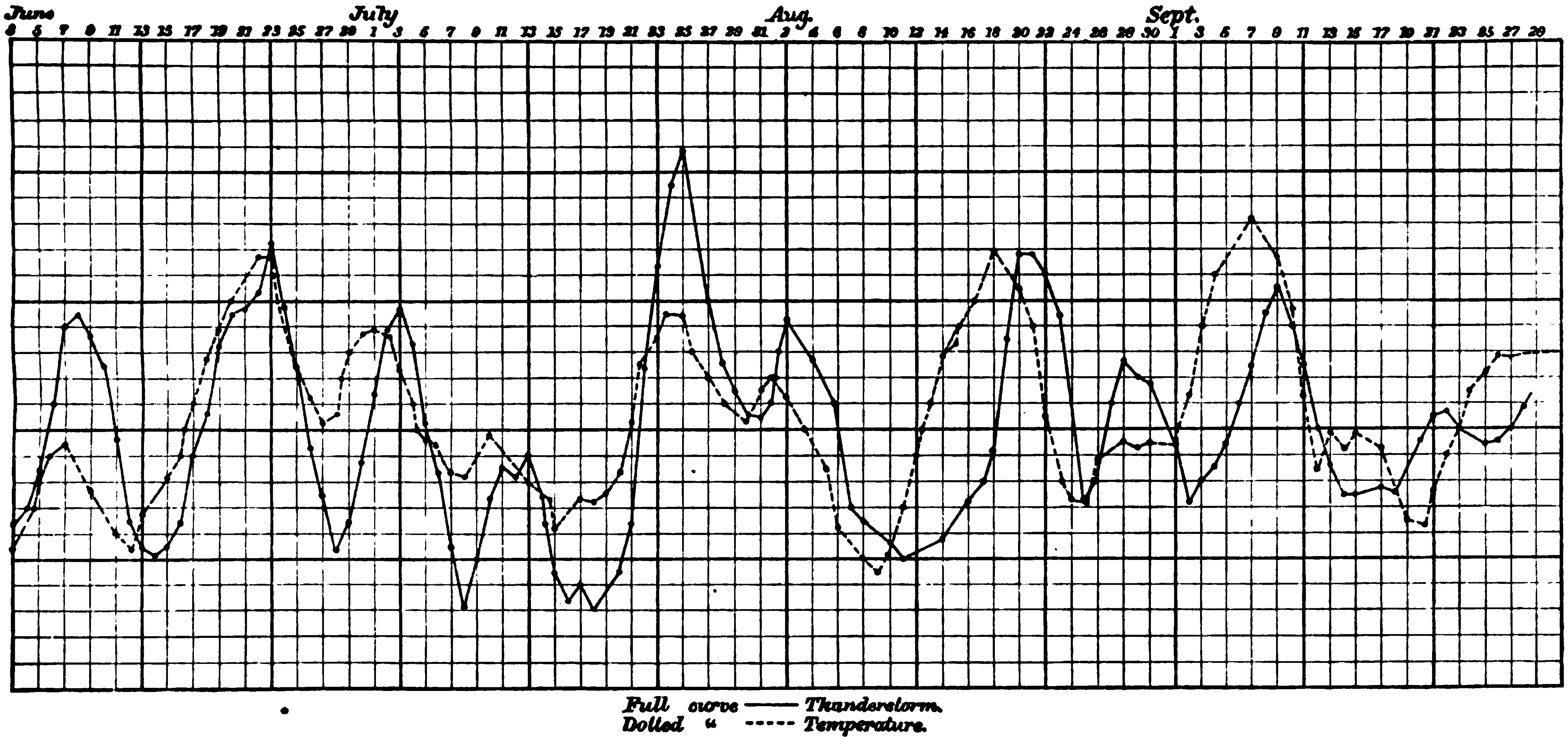
THUNDER-STORMS AND TEMPERATURE.

All the records were grouped by each day from May 1 to October 31, and their frequency for each day is shown in Table I; there is also shown in the same table the mean temperature over the whole region of observation. The method of obtaining this mean temperature was as follows: A plate of glass covering the whole region had drawn upon it squares of 2°.5 east and west as well as north and south; this plate was laid upon the daily maps in succession and the temperature of each square obtained from the isotherms. The mean temperature of all the squares gave that of the whole country. If the figures be projected graphically a remarkable coincidence will be found, a maximum of storms occurring usually a little later than that of temperature. In order to eliminate the effect of seasonal change on the temperature and also to smooth out the great irregularities, Table II has been prepared in the following manner: First, the departure from the monthly mean number of storms for each day was prepared, as well as for temperature; next a five-day mean was taken for both storms and temperature from these figures.

TABLE I.—*Number of thunder-storms and mean air temperature for the region of observation from May to October*, 1884.

Day.	May, number of storms.	June.		July.		August.		September.		October, number of storms.
		Number of storms.	Mean temp.	Number of storms.	Mean temp.	Number of storms.	Mean temp.	Number of storms.	Mean temp.	
			°		°		°		°	
1	23	80	58.7	149	69.0	62	65.0	22	60.0	21
2	20	62	58.0	186	67.7	96	68.3	31	61.3	19
3	15	84	61.0	188	68.3	116	67.0	42	67.7	21
4	44	43	61.0	205	68.3	209	61.0	4	66.7	61
5	59	52	62.3	173	64.3	67	59.7	85	70.7	35
6	43	100	63.0	71	68.3	40	61.7	45	69.7	29
7	16	127	66.7	38	62.0	38	61.7	87	66.0	26
8	19	218	67.3	82	65.3	55	55.7	114	72.8	42
9	44	193	62.3	78	64.3	23	57.3	116	69.0	20
10	35	84	55.0	53	64.0	60	57.7	137	69.3	8
11	26	52	60.7	169	66.0	28	59.3	91	62.7	8
12	64	63	65.0	153	67.0	15	64.0	29	55.8	49
13	66	74	61.7	126	62.8	18	65.8	21	56.3	16
14	82	89	60.7	68	61.0	81	66.0	19	55.7	9
15	28	86	60.8	93	62.0	68	67.7	48	61.8	7
16	24	34	64.3	51	61.3	46	69.3	29	59.0	26
17	50	82	67.8	39	63.0	48	68.8	29	58.7	6
18	94	108	68.0	80	63.7	66	70.0	29	54.8	8
19	122	177	68.3	102	63.3	69	72.7	25	54.7	12
20	70	113	69.7	45	61.7	116	72.7	42	53.0	10
21	63	167	70.7	71	63.0	275	67.8	62	51.7	19
22	87	140	72.0	91	68.8	193	62.7	90	59.8	25
23	121	117	73.8	219	72.7	65	59.7	83	61.7	5
24	91	219	73.7	360	73.0	43	60.8	29	61.0	3
25	65	200	69.8	251	67.7	40	60.0	19	56.8	2
26	81	46	58.7	225	67.7	61	62.7	51	56.0	4
27	112	32	62.7	155	68.8	50	62.0	78	63.3	1
28	32	30	67.0	175	65.8	108	65.3	81	65.3	0
29	24	48	68.3	182	65.7	143	65.3	88	60.7	2
30	16	92	70.7	122	66.0	169	61.7	74	59.3	9
31	28	....	....	167	66.0	25	60.7	....	....	0
Mean	52	97	65.0	133	65.5	79	65.7	55	61.4	16

FLUCTUATIONS OF TEMPERATURE AND THUNDERSTORM FREQUENCY.



Appendix 25, Signal, 1886.

TABLE II.—*Departure from mean monthly values of storm frequency and mean temperature, with 5-day means of same.*

Day.	Daily values.								Five-days means.							
	June.		July.		Aug.		Sept.		June.		July.		Aug.		Sept.	
	Storms.	Temp.	Storms.	Temp.	Storms.	Temp.	Storms.	Temp.	Storms.	Temp.	Storms.	Temp.	Storms.	Temp.	Storms.	Temp.
		°		°		°		°		°		°		°		°
1	—17	—6.2	16	4.5	—17	1.2	—33	—1.4	....	....	13	8.7	12	1.3	— 7	—.1
2	—35	—6.9	53	2.2	17	4.5	—24	—0.1	....	....	38	3.6	40	1.3	—28	1.4
3	—13	—3.9	55	2.8	35	3.2	—13	6.3	—33	—4.7	47	7.2	32	.4	—21	3.9
4	—54	—3.9	72	2.8	131	—2.8	—14	5.3	—29	—3.8	32	.9	27	— .3	—16	5.8
5	—45	—2.6	40	—1.2	—10	—4.1	—20	9.3	—16	—2.1	2	— .3	16	—1.6	— 5	6.8
6	3	—1.9	—62	—2.2	—39	—2.1	—10	8.3	11	—0.8	—19	— .9	4	—3.8	9	7.7
7	30	1.8	—93	—3.5	—41	—2.1	82	4.6	41	— .6	—45	—1.7	—34	—4.6	24	8.1
8	121	2.4	—51	— .2	—23	—8.1	59	10.6	47	—2.0	—69	—1.9	—36	—5.0	45	7.9
9	96	—2.6	—55	—1.2	—56	—6.5	61	7.6	38	—2.5	—49	—1.2	—38	—5.5	54	6.5
10	—13	—9.9	—80	—1.5	—19	—6.1	82	7.9	25	—2.8	—26	— .2	—43	—5.0	42	4.3
11	—45	—4.2	36	.5	—51	—4.5	36	1.3	— 4	—4.0	—17	— .8	—50	—3.1	24	1.2
12	—34	.5	20	1.5	—64	.2	—26	—6.1	—35	—4.3	—19	—1.4	—49	—1.3	4	—1.5
13	—23	—3.2	— 7	—3.2	—61	1.5	—34	—4.9	—44	—3.2	—11	—1.8	—47	.7	—13	— .1
14	—58	—4.2	—65	—4.5	—48	2.2	—36	—5.7	—48	—2.5	—35	—2.8	—43	2.7	—26	— .8
15	—61	—4.6	—40	—3.5	—11	3.9	— 7	— .1	—44	—2.0	—58	—3.6	—37	3.5	—26	— .2
16	—63	— .6	—82	—4.2	—33	5.5	—26	—2.4	—37	— .8	—61	—3.3	—27	4.5	—24	— .6
17	—15	2.4	—94	—2.5	—31	4.5	—26	—2.7	—10	.7	—60	—2.8	—20	5.8	—23	— .8
18	11	3.1	—53	—1.8	—13	6.2	—26	—9.1	6	2.6	—70	—2.9	— 8	6.8	—24	—2.5
19	80	3.4	—31	—2.2	—19	8.9	—30	—6.7	32	3.9	—60	—2.6	38	6.4	—18	—3.9
20	16	4.8	—88	—3.8	47	8.9	—13	—8.4	44	4.8	—55	—1.6	67	5.3	— 5	3.8
21	70	5.8	—62	—2.5	196	3.5	7	—9.7	46	5.7	—27	.3	67	3.2	5	—2.3
22	43	7.1	—42	2.8	114	—1.1	35	—2.1	54	6 8	24	2.2	61	.7	6	1.1
23	20	7.4	86	7.2	—14	—4.1	28	.3	72	6.7	65	3.4	44	—1.8	2	.0
24	122	8.8	227	7.5	—36	—3.5	—26	— .4	47	4.3	96	4.4	1	—2.7	—1	1.3
25	108	4.4	118	2.2	—39	—3.8	—36	—3.1	26	2.4	109	4.4	—27	—2.9	—3	2.1
26	—51	—6.2	92	2.2	—18	—1.1	— 4	—3.4	— 8	1.4	97	2.9	—19	—1.7	—3	2.8
27	—65	—2.2	22	2.8	—29	—1.8	23	1.9	—27	.3	51	1.4	2	— .7	—1	2.7
28	—67	2.1	24	— .2	29	1.5	26	3.9	—48	.6	25	1.1	27	— .4	10	2.9
29	—54	3.4	— 1	.2	65	1.5	—15	— .7	—35	2.7	14	.8	20	— .8	....	....
30	— 5	5.8	—11	.5	90	—2.1	19	—2.1	—11	3.6	16	.4	19	— .7	....	....
31	....	—	....	.5	—54	—3.1	....	....	....	....	4	1.4	9	—1.0	....	....

In order to present the facts developed in an easy form for comprehension, Fig. 1 has been prepared showing the five-day mean of storm frequency and mean temperature fluctuations. These curves exhibit a remarkable uniformity and show clearly an interdependence between high temperature and a relatively large number of thunder-storms. The maximum points in the temperature curve seem to precede the same in the storm frequency by one or two days (Fig. 1). In order to study this question more closely, there were selected out thirty days in May, June, July, and August having the greatest number of storms in each day, and in like manner thirty days having the least number. Taking groups of ten days each, the mean temperature for each group from the Signal Service observations was obtained, and in like manner for each 10-day group of few storms. These results are embodied in Table III.

TABLE III.—*Mean 10-day temperatures at selected stations.*

	Days of storms.					Days of few storms.				
	7.00.		15.00.		Mean.	7.00.		15.00.		Mean.
	First set.	Second set.	First set.	Second set.		First set.	Second set.	First set.	Second set.	
Boston	69	68	72	77	72	63	64	58	72	64
Eastport	59	60	62	66	62	56	52	54	63	56
Albany	71	71	80	80	76	65	65	64	74	67
New York City	71	72	76	80	75	65	66	64	75	68
Norfolk	77	76	82	87	80	72	72	70	78	73
Philadelphia	71	72	79	84	76	66	65	65	75	68
Washington City	74	72	84	86	79	66	66	68	79	70
Augusta	75	74	84	87	80	76	72	80	86	78
Jacksonville	80	78	83	88	82	79	75	81	87	80
Montgomery	76	74	88	87	81	76	69	80	87	78
New Orleans	81	80	84	87	83	82	77	79	90	86
Fort Smith	75	70	79	91	79	78	67	78	89	77
Indianola	80	78	82	89	82	79	78	80	89	82
Shreveport	80	76	84	[89]	82	78	68	79	93	80
Cincinnati	77	73	77	87	78	67	65	70	80	70
Memphis	79	76	81	92	82	75	70	74	85	76
Pittsburg	72	69	80	83	76	64	60	68	78	68
Buffalo	66	69	68	70	68	74	60	58	66	64
Cleveland	70	68	78	75	72	64	61	61	69	64
Oswego	66	69	78	71	71	54	61	55	63	58
Alpena	58	62	59	[62]	60	55	57	55	66	58
Duluth	59	60	58	59	58	60	61	58	62	63
Davenport	70	67	71	78	72	62	64	69	76	68
Saint Louis	74	72	77	85	80	70	67	68	80	71
Saint Paul	65	64	70	79	70	61	62	73	78	68
Leavenworth	73	69	78	87	76	70	65	71	84	76
Omaha	70	61	72	81	72	68	65	72	82	72
Yankton	64	63	78	80	70	63	61	75	84	71
Bismarck	58	54	70	73	64	60	63	74	74	68
Saint Vincent	56	52	69	70	62	54	58	70	70	63

Each set of 10 days was projected upon separate charts for study, but, for the purpose of this paper, it has been deemed sufficient to give only the means for 30 days. (See the dotted curves on Figures 2 and 3.) A careful study of these curves shows somewhat higher temperatures on days of many storms than on days of few storms, as has already been shown. These contrasts would have been somewhat greater if the day before that of the greatest number of storms had been selected as already shown in Fig. 1. There seems to be no marked increase in temperature toward the south, or, in other words, there are no great contrasts of temperature from north to south, but rather a uniform increase over the whole region.

THUNDER-STORMS AND RELATIVE HUMIDITY.

In the same way as with the temperature above, the relative humidity was computed for each 10 days and projected upon maps. The results show only a slight difference for days of storms as compared with days of few storms. The dew-point temperatures for 20 days and at 15^h have been selected out in the same manner and are given in Table IV.

Fig. 2. MEAN PRESSURE AND TEMPERATURE DAYS OF [illegible]

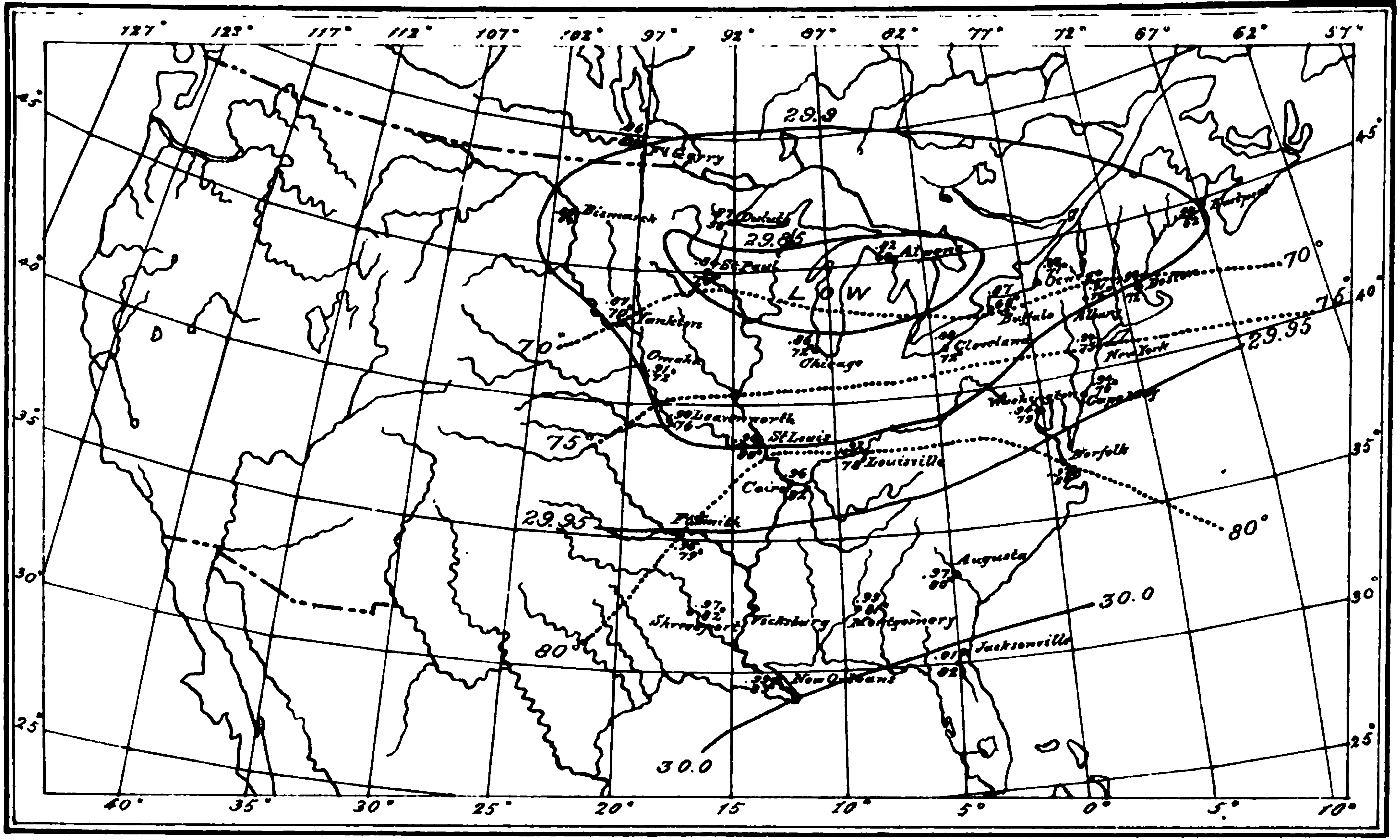


Fig. 3.--MEAN PRESSURE AND TEMPERATURE DAYS OF FEW STORMS.

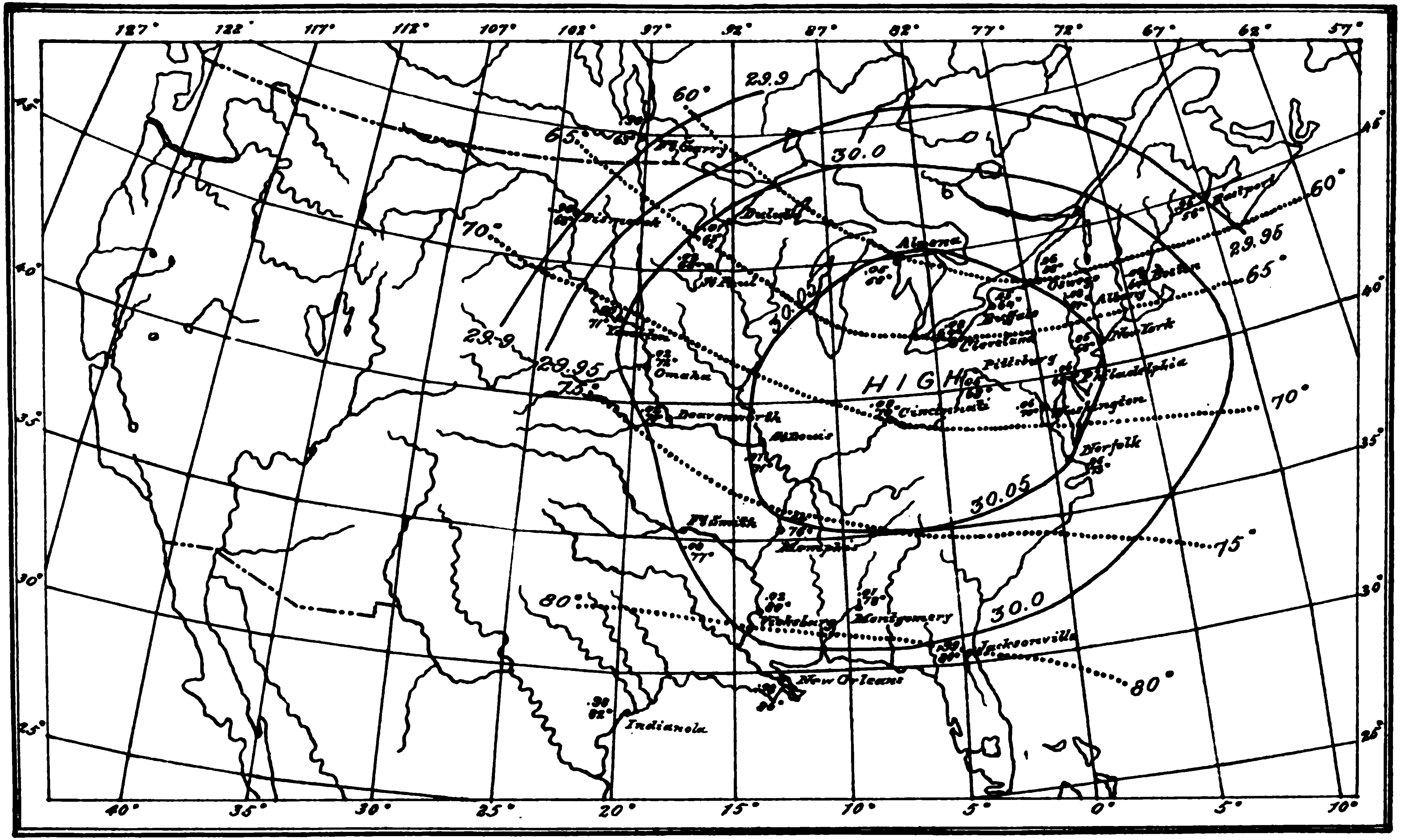


TABLE IV.—*Mean 10-day dew-point at selected stations.*

	Days of storms.			Days of few storms.		
	First set.	Second set.	Mean.	First set.	Second set.	Mean.
Boston	58	64	61	44	56	50
Eastport	49	54	52	38	55	46
Albany	57	62	60	39	49	44
New York City	53	66	70	45	53	49
Norfolk	63	73	68	52	64	58
Philadelphia	71	73	72	52	60	56
Washington City	64	71	68	50	52	51
Augusta	94	72	83	58	57	62
Jacksonville	69	73	71	64	74	69
Montgomery	63	71	67	61	68	64
New Orleans	67	71	69	64	72	68
Fort Smith	59	70	64	56	71	64
Indianola	73	75	74	68	76	72
Shreveport	69	72	70	67	73	70
Cincinnati	60	66	63	51	51	51
Memphis	61	73	67	59	70	64
Pittsburg	60	64	62	48	50	49
Buffalo	68	[63]	66	40	52	46
Cleveland	56	62	59	44	50	47
Oswego	58	60	59	41	54	48
Alpena	49	51	50	38	46	42
Duluth	43	52	48	40	52	46
Davenport	58	67	62	49	56	52
Saint Louis	59	72	66	54	65	60
Saint Paul	57	64	60	56	63	60
Leavenworth	54	67	60	48	66	57
Omaha	58	68	63	54	67	60
Yankton	51	64	58	50	66	58
Bismarck	50	56	53	49	63	56
Saint Vincent	50	61	56	52	59	56

These were also projected upon charts and studied. The results showed a normal condition of the dew-point and vapor-tension during both classes of days with and without storms. The charts have not been reproduced in this publication, but they may be readily made from the table. It will be found that the dew-points have a little higher tendency on storm days, but it should be noted that this is due to the higher air temperature on those days. These computations show that the moisture contents of the air just before the approach of a thunder-storm are but little changed. This rather surprising result has been noted in individual observations; very frequently the sling psychrometer has exhibited no change in humidity as the storm came up; sometimes by swinging under an umbrella it has been possible to determine this even after rain has begun falling. The same data regarding the weather were also prepared, showing no marked contrasts between days of storms and few storms.

THUNDER-STORMS AND AIR PRESSURE.

The mean 7 a. m. air-pressure in groups of 10 days was determined as in the previous cases and is exhibited in Table V.

TABLE V.—*Mean 10 days' air pressure at selected stations.*

	Days of storms.				Days of few storms.			
	First set.	Second set.	Third set.	Mean.	First set.	Second set.	Third set.	Mean.
Boston	.90	.85	.04	.93	.10	.87	.08	.02
Eastport	.86	.82	.38	.90	.02	.75	.07	.95
Albany	.87	.83	.02	.91	.11	.86	.11	.03
New York City	.92	.87	.04	.94	.12	.92	.10	.05
Norfolk	.93	.92	.07	.97	.12	.97	.06	.05
Philadelphia	.92	.87	.04	.94	.13	.95	.09	.06
Washington City	.92	.87	.04	.94	.13	.97	.09	.06
Augusta	.96	.86	.09	.97	.08	.98	.07	.04
Jacksonville	.96	.99	.08	.01	.03	.95	.99	.99
Montgomery	.93	.96	.08	.99	.01	[.97]	.04	.01
New Orleans	.94	.98	.04	.99	.97	.98	.99	.98
Fort Smith	.92	.88	.04	.95	.01	.96	.03	.00
Indianola	.91	.97	.00	.96	.97	.99	.97	.98
Shreveport	.91	.95	.05	.97	.01	.99	.05	.02
Cincinnati	.88	.86	.02	.92	.11	.03	.10	.08
Memphis	.92	.91	.04	.96	.07	.01	.03	.04
Pittsburg	.77	.83	.98	.86	.10	.98	.08	.05
Buffalo	.86	.83	.91	.87	.11	.96	.08	.05
Cleveland	.85	.83	.95	.88	.12	.03	.08	.08
Oswego	.88	.84	.93	.88	.15	.94	.10	.06
Alpena	.86	.73	.86	.82	.13	.01	.01	.05
Duluth	.92	.85	.83	.87	.07	.99	.98	.01
Davenport	.84	.83	.91	.86	.11	.03	.02	.05
Saint Louis	.86	.86	.99	.90	.10	.03	.08	.07
Saint Paul	.82	.83	.86	.84	.07	.01	.97	.02
Leavenworth	.88	.86	.96	.90	.08	.97	.00	.02
Omaha	.89	.97	.97	.91	.10	.96	.00	.02
Yankton	.88	.86	.88	.87	.05	.93	.01	.00
Bismarck	.91	.85	.92	.89	.94	.84	.91	.90
Saint Vincent	.90	.82	.86	.86	.95	.89	.86	.90

The 30 days' mean has been projected in the full curves of Figs. 2 and 3. We find that Fig. 2 shows in a marked degree a low area to the north and northwest of the region of greatest frequency of thunder-storms, and its center at a distance of about 350 miles. Fig. 3, however, is just the reverse, showing a high area to the north and northeast of the thunder-storm region. These results are exhibited on each of the groups of ten days. To sum up these results, we see (1) that the humidity and weather conditions are but slightly, if at all, affected on days of thunder-storm action, which would seem to show a concentration of unusual rainfall action at the time of thunder-storms rather than a general rain such as might be expected in connection with the prominent low area, which is almost invariably present. (2) The temperature, while showing no marked contrasts in a north and south direction, yet does show a fair increase on days of most storms. The date of this increase is slightly in advance of that of the greatest number of storms. (3) The most marked characteristic, however, is the presence of a low area to the north and northwest of greatest thunder-storm action, and its replacement almost exactly by a high area on days of few storms. This goes to show that, in the United States at least, there is a very notable connection between a low area and thunder-storm action.

It is evident that a thorough study of some general storm action and its accompanying low area must give an important addition to our knowledge. Such a study demands exact knowledge as to the time of beginning and ending of storm action, rain and wind, as well as the gaps (if there be such) in all these phenomena occurring to the southeast of a low area. A beginning of such study has already been made, and has revealed some very surprising results. The storms of May 18 and 19, 1884, were widespread over the region of observation. They began on May 18 in Illinois, reached a maximum of action at 16^h, then died down at night to begin again the next day at a point somewhat to the east of the starting point of the previous day. The velocity of the low area was about 21 miles per hour, while that of the thunder-storms was 41 miles per hour.

This enormous increase in the velocity is difficult to explain, and demands further investigation. It would seem to show that while the action is coincident with the presence of a low area, yet it is largely independent of it. Possibly the low area serves as a medium of concentration of the electrical action in its southeast quadrant, while the effects of this action are separate from the influence of low pressure. There seems to be very little doubt that thunder-storm action is downward from the upper atmosphere.

A normal storm is frequently ushered in by a very sudden gust of wind, which has been blowing gently from the south all day in accordance with the usual barometric gradient, toward the low area. With this high wind there comes a rise in pressure which reaches a maximum at the same time as the maximum of the storm. As the storm advances the lightning and thunder increase, and after it passes the wind dies down very markedly. That there is a down rush in the center of a thunder-storm is proved by the fact that if the storm is to the south the wind is very strong from that direction, while if it is toward the north the wind is just as strong from the north, although it may have been blowing gently from the south up to the time of the storm.

AIR PRESSURE IN THE CENTER OF A STORM.

During 1883 and 1884 the writer watched with great care every thunder-storm as it came up and passed off, counting the distance in every case where the lightning and thunder were distinct and could be connected. These records, together with the barograph curves of the Signal Office, will enable us to determine whether there is any marked effect on the air pressure or not on the approach and passage of a storm. Table VI contains records taken from the barograph trace every fifteen minutes, and oftener whenever there was a great fluctuation.

TABLE VI.—*Observations of barograph on thunder-storm days 1883 and 1884.*

Time.	May 5, 14h.	May 21, 7h.	May 21, 14h.	May 22, 3h.	June 10, 20h.	June 13, 16h.	June 16, 21h.	June 19, 2h.	June 21, 20h.	June 29, 14h.	July 5, 14h.	July 6, 18h.	July 8, 14h.	July 13, 15h.	July 15, 15h.	July 24, 14h.	July 28, 20h.	Aug. 23, 15h.
h. m.																		
00......	30.044	29.406	29.269	29.342	29.600	29.630	30.006	29.709	29.757	29.704	29.953	29.878	29.670	29.647	29.671	29.657	29.835	29.800
		.368	.267	.346	.592					.712								
15......	.042	.419t	.248	.343	....	.618	.004	.707	.760	.706	.942	.884	.665	.646	.668	.640	.836	.797
		.406	.260	.340									.668	.644				
30......	.042	.419	.250	.364	.597	.614	.000	.705	.777	.704	.948	.882	.663	.649	.660	.627	.834	.797
		.406	.245	.350					.816t						.675	.624		
45......	.044	.402	.216	.372	.600	.603	.002	.753t	.803	.700	.950	.882	.663	.648	.665	.654	.829	.789
				.380							.958			.640	.648	.655		.800
															.672			
1 00......	.057	.407	.240	.378	.610	.604	29.996	.756	.793	.698	.955	.878	.659	.649	.648	.640	.838	.788
		.377	.226	.366	.623		30.000					.885		.648		.628		.800
15......	.060	.372	.238	.372	.632	.606	.045	.724	.793	.718	.958	.884	.659	....	.648	.628	.840	.816
	.082t	.370	.239	.372	.686t	.652t	.062			.726			.693t					.839
							.072t											
30......	.086	.416	.270	.366	.640	.643	.050	.718	.799	.750	.963	.882	.680	.673	.648	.640	.855	.807
		.377	.290t	.359		.640	.060							.673		.654		.846
																		.887t
45......	.078	.394	.275	.377t	.643	.643	.050	.717	.800	.750	.982	.889	.677	.702t	.694t	.646	.872	.860
	.057	.380	.286	.377							30.035t			.704	.656			
2 00......	.078	.403	.244	.368	.642	.646	.048	.720	.800	.744	.028	.900	.670	.699	.643	.635	.898t	.844
			.278		.648									.682				
15......	.078	.380	.239	.348	.646	.653	.043	.754	.798	.726	29.999	.921t	.668	.698	.630	.620	.886	.840
			.280									.921		.707		.618		
30......	.078	.382	.239	.379	....	....	.084	.760	.800	.721	.983	.902	.665	.716	.629	.664	.880	.807
			.277													.684	.877	
45......	.078	....	.236	....	....	....	.030	.718	....	.720	.977	.900	.665	.706	.651	.718t	.900	.808
											.953				.697			
3 00......	.078	....	.237	....	....	....	.006	.703	....	.720	.947	.898	.663	.673	.680	.702	.880	.820
										.718					.678			
15......	.038	....	.237	....	....	....	.006	.698	....	.721	.953	.892	.665	....	.684	.677	.876	.822
										.727								
30......	....	....	.240	....	....	....	29.996	.700	....	.723	.942	.888	.668	....	.678	.696	.878	.806
																.702		.801
45......	....	....	.228	....	....	....	.986	....	....	....	.952	.886	.670	....	.686	.680	.877	.814
																	.869	
4 00......	....	....	.228	....	....	....	.984	....	....	....	.953	.884	.673	....	.694	.715	.880	.832
15......	....	....	.226	....	....	....	.994	....	....	....	....	....	....	....	....	.716	.834	.824
30......	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	.866	.836
45......	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	.880	.822

1884.

Time.	Feb. 14, 5h.	Feb. 23, 0h.	Mar. 9, 8h.	Mar. 26, 14h.	Apr. 2, 12h.	May 5, 19h.	May 19, 19h.	May 23, 19h.	May 24, 19h.	June 10, 21h.	July 1, 19h.	July 11, 13h.	July 24, 16.30h.	July 29, 13h.	Aug. 21, 13h.	Aug. 30, 15h.
h. m.																
0 00	29.589	29.823	29.976	29.496	29.167	29.798	29.638	29.897	29.719	29.724	29.785	29.742	29.744	29.545	29.939	29.637
15	.588	.820	.959	.488	.166	.799	.638	.902	.714	.740	.792	.722	.743	.539	.920	.637
	.593										.776	.722				
30	.586	.816	.970	.496	.174	.803	.639	.901	.720	.756	.780	.706	.737	.537	.916	.634
									.721							
45	.582	.815	30.003	.486	.201	.806	.646	.901	.744	.758	.780	.737	.785	.536	.911	.637
	.574		29.983	.497												
1 00	.578	.794	.994t	.518t	.202	.844t	.646	.904	.740	.760	.824t	.742	.737	.542t	.903	.639
				.492												
15	.592t	.773	.977	.480	.191	.843	.646	.906	.758t	.763	.810	.743	.831t	.528	.900	.636
	.589							.903								
30	.600	.766	.981	.480	.222	.826	.639	.948t	.753	.766	.806	.754t	.837	.507	.900	.627
	.588		.966						.748		.820					
45	.592	.762	.972	.480	.257t	.827	.682	.948	.748	.774	.823	.756	.862t	.524	.914	.642
	.603t				.256	.843		.938							.907	
2 00	.598	.780	.983	......	.226	.857	.700t	.920	.754	.794	.824t	.746	.867	.538	.943t	.654t
		.764	.958				.686									
15	.594	.776	.930	......	.215	.864	.676	.904	.773	.807t	.823	.744	.866	.542	.917	.646
	.583	.740				.856						.748				
30	.576	.720	.913	......	.180	.852	.676	.890	.759	.806	.822	.760t	.822	.543	.902	.636
	.596															
45	.606	.712	.938	......	.208	.857	.666	.874	.758	.797	.822	.768	.788	.542	.902	.642
	.600			......			.674					.752				
3 00	.612	.680	.922	......	.204	.846	.685	.874	.758	.797	.817	.748	.780	.541	.898	.640
							.697									
15	.623	.675	.918	......	.186	.824	.683	.901	......	.797	.798	.757	.779	.544	.896	.639
	.611															
30	.644	......	.862	......	.182	.806	.700	.902	......	.797	.798	.765	.792	.550	.896	.642
	.628		.866													
45	.652	......	......	......	.180	.807	.708	.902	......	.807	.784	.760	.795	.560	.896	.643
										.796		.754				
4 00	......	......	......	......	.178	.805	.726	.902	......	.812t	.777	.760	.795	.576	.897	......
15	......	......	......	......	.180	.800	......	......	......	.816	......	.782	.795	.578	.897	......
										.797						
30	......	......	......	......	.208	.798	......	......	......	.782	......	.795	.796	.580	.897	......
45	......	......	......	......	.188	......	......	......	......	.795	......	.795	.819	.582	......	......
5 00	......	......	......	......	.182	......	......	......	......	......	......	......	......	......	......	......

In this table the hour of beginning of observations is indicated at the top of each column and the time of each record is shown on the left, *i. e.*, the time of each record may be found by adding the hour and minute on the left to the hour at the top of each column. It should be noted that the exact time of the trace is not known to several minutes, and, moreover, the severest part of a thunder-storm may be some time in passing a given point. There will also be a slight difference in the effect if the storm passes centrally than if to either side. The place of occurrence of the storm is indicated by a *t* at the right of the column coincident with the time of the storm. When there were two periods of activity there are two *t*'s. If these figures be projected in curves there will be found frequent and sudden oscillations at the time of the storm. When it is considered that in the summer-time the barograph trace is usually very uniform, these sudden fluctuations are very remarkable, and indicate a uniformly sudden rise in air pressure on the passage of a thunder-storm. It would be a matter of great interest if there were studied in this connection the movement of the high wind, the oscillation of rainfall, direction of wind, &c.

THUNDER-STORMS AND THE MOON.

Dr. Köppen has recently published a short article in the Meteorologische Zeitschrift, which seems to show a slight effect of the moon's phases upon the frequency of storms. All the observations available for 1884 were compiled in four groups, each group containing all the storms for seven days, as follows: the center day for first group was, new moon; second, first quarter; third, full moon, and, fourth, last quarter. There were added to each of these the records for the three days immediately preceding and following the center day. Percentages were then taken for each phase of the moon. Table VII contains these results. For the purpose of comparison I have added the results obtained by Dr. Köppen.

TABLE VII.—*Thunder-storms and Moon.*

Phase.	Köppen.		Signal Service, 1884.	
	No. of storms.	Per cent.	No. of storms.	Per cent.
New	336	25.2	3,538	29.5
First quarter	406	30.5	3,232	27.0
Full	270	20.3	2,930	24.4
Last quarter	321	24.1	2,296	19.1
Total	1,333	100.1	11,996	100.0

The above results are quite accordant, and seem to show a tendency to a greater number of storms at time of new moon and first quarter than during the other two phases. The observations of 1884 seem also to confirm the commonly-accepted theory that during the time of full moon there are far fewer clouds in summer than during the time of new moon. In order to test the question more fully Table VIII was prepared, in which the number of storms has been compiled according to each day of a lunation for five lunations.

Fig. 4.

THUNDERSTORMS AND MOON.

Full Curve —— Daily Sums.
Dotted " ---- 5 Day Means.

Appendix 25, Signal, 1886.

TABLE VIII.—*Thunder-storms and the moon.*

	First lunation.	Second lunation.	Third lunation.	Fourth lunation.	Fifth lunation.	Total.	Mean of five days.
Days preceding new moon:							
15	44	127	173	41	69	454	428
14	35	218	71	35	40	399	427
13	26	198	38	45	38	340	380
12	64	84	82	87	56	373	354
11	66	52	78	114	23	333	361
10	32	63	58	116	60	324	358
9	28	74	169	137	28	436	335
8	24	39	153	91	15	322	318
7	54	36	126	29	18	259	330
6	94	34	68	21	31	248	307
5	122	82	98	19	68	384	314
4	70	108	51	48	46	323	337
3	63	177	39	29	48	356	385
2	87	118	80	29	66	375	392
1	121	167	102	29	69	488	441
New moon	91	140	45	25	116	417	499
Days following new moon:							
1	65	117	71	42	275	570	561
2	81	219	92	62	198	646	577
3	112	200	219	90	65	686	586
4	32	46	360	83	43	564	525
5	24	32	251	29	40	376	461
6	16	30	225	19	61	351	427
7	28	43	155	51	50	327	427
8	80	92	151	78	108	515	472
9	62	149	132	81	143	567	501
10	84	186	122	38	169	599	508
11	43	188	167	74	25	497	489
12	52	205	62	21	22	362	451
13	100	178	96	19	31	419	445
14	127	71	116	21	42	377	436
15	218	38	210	61	41	568	443

The center of the table was chosen for the time of new moon, and starting with this date storms preceding and following were tabulated. The total number of storms for each day of the five lunations was computed, and the mean for each five days taken. Fig. 4 shows a projection of these values. We find from the curve of five days' means, minima at the sixth day before and after new moon, while the maxima occur at the second and tenth day after the same epoch. These results, while interesting, are not advanced here as giving any explanation. The subject seems to be sufficiently important to warrant further investigation. That the tides have some unexplained influence upon the occurrence of storms is a well defined belief along the Atlantic border and Long Island Sound. It is said by those who have studied the subject that no thunder-storms occur on a falling tide. It will be readily seen that if this be so the subject is far-reaching, and that there would seem to be a possible action of the moon which will extend over the whole earth and not merely near the sea-coast.

THUNDER-STORMS AND SOLAR ROTATION.

In the same way as just described for the moon a table has been prepared showing the distribution of thunder-storms in respect to the period of rotation of the sun. The Royal Observatory at Greenwich has assumed the period of rotation as 25.38 days. The starting point of one of these periods is May, 15.06, 1884, and this was chosen for the first day of the present investigations. Six complete revolutions of the sun were taken, ending in October. Table IX exhibits the results and Fig. 6 shows the same graphically. The dotted curve shows a well-marked minimum on the thirteenth day of rotation and a maximum on the twenty-fourth.

TABLE IX.—*Thunder-storm frequency and solar rotation.*

[The day of the solar rotation in the first line was May 15.06. Six complete rotations were used, counting in October.]

Days of rotation.	Rotations.						Sum.	Mean of each five days.
	1.	2.	3.	4.	5.	6.		
1	28	198	178	122	40	25	591	547
2	24	84	71	167	61	42	449	505
3	50	52	38	62	56	62	314	499
4	49	63	82	96	106	90	533	496
5	122	74	78	116	143	83	616	483
6	70	39	58	210	169	29	570	497
7	68	36	169	69	25	19	381	486
8	87	34	153	40	22	51	387	452
9	121	82	126	38	31	78	476	425
10	91	108	68	56	42	81	446	432
11	65	177	93	23	41	38	437	437
12	81	113	51	60	35	74	414	416
13	112	167	39	28	45	21	412	406
14	32	140	80	15	87	19	373	417
15	24	117	102	18	114	21	396	442
16	16	219	45	31	116	61	488	436
17	28	200	71	68	137	35	539	444
18	80	46	91	46	91	29	383	486
19	62	32	219	48	29	26	416	477
20	84	30	360	66	21	42	608	478
21	43	43	251	69	19	20	445	544
22	53	92	225	116	48	8	541	609
23	100	149	155	275	29	8	716	618
24	127	186	157	193	29	49	741	645
25	218	188	132	65	29	16	648	627

In absence of any *apriori* reason for any such fluctuation it is impossible to say of how much value these curves are. It will require many more observations of a corroborative nature to establish the truth of this oscillation. The results are sufficiently interesting to demand further study.

The above paper is given as a study of the thunder-storm observations for 1884. The observations themselves form a most valuable storehouse for future reference as questions shall arise regarding the nature of thunder-storms. It would seem as if we needed now a still more detailed study of storms over a limited region and a careful hourly plotting of the occurrences of storm, rain, wind, hail, &c., also an investigation into the connection which exists between thunder-storms and tornadoes or destructive storms.

Fig. 6.

THUNDERSTORMS AND SOLAR ROTATION.

Full Curve,—— Daily Sums.
Dotted " ------ 5 Day Means.

Appendix 25, Signal, 1890.

APPENDIX 26.

INSTRUCTIONS TO VOLUNTARY OBSERVERS OF THE SIGNAL SERVICE.

SIGNAL OFFICE, WAR DEPARTMENT,
Washington City, October 15, 1886.

SIR: I have the honor to submit herewith a revised copy of the instructions to voluntary observers of the Signal Service. The first edition, prepared in 1882, is nearly exhausted, and as a large number will be required during the current year to supply the numerous local organizations and State weather services co-operating with the Signal Service in collecting and distributing meteorological data, I recommend that this revision be printed as an appendix to your annual report.

I am, very respectfully, your obedient servant,

H. H. C. DUNWOODY,
First Lieutenant, Fourth Artillery, Acting Signal Officer and Assistant.

The CHIEF SIGNAL OFFICER U. S. ARMY,
Washington City.

REVIEW DIVISION, *October* 13, 1886.

DEAR SIR: I have the honor to forward herewith a revised copy of instructions to voluntary observers made under your direction.

Very respectfully,

H. A. HAZEN,
Junior Professor, Signal Office.

Lieutenant DUNWOODY.

INSTRUCTIONS TO VOLUNTARY OBSERVERS OF THE SIGNAL SERVICE.

INTRODUCTION.

The science of the weather is becoming more and more largely developed, and is to-day attracting thousands who are anxious to learn the meaning of signs and to forecast the weather in the immediate future. It is a science of which it is easy for young or old to become votaries, and every town of any size has its weather-wise. There are to-day many sayings of doubtful value as regards the effect of the moon, the present length of the seasons as compared with former times, the amount of rain, the depth of snow, &c., which can be checked only by long-continued and careful observations. Take the matter of rainfall alone, which is of such prime importance to the farmer. The observation and record of rain is one of the easiest that can be made, and it would be of great value if we had stations 20 miles apart over the whole farming country; but, as it is, stations are about 40 miles apart, and large areas are entirely uncovered. Several of the more important observations, such as of temperature, rain, wind, thunder-storms, frosts, &c., are very simple indeed, and may be taken even by a child. It is the object of this book to give a few simple directions which will enable any one to make weather observations, to become an authority among his neighbors, and, at the same time, to aid the determination of the distribution of temperature, rain, thunder-storms, frosts, &c., as it is now being carried on at the central office of the United States Signal Service in Washington City.

Acknowledgment is made for assistance derived from Blanford's Vade Mecum, Scott's Instructions, Canadian Instructions, Loomis's Meteorology, and other authorities.

GENERAL CONSIDERATIONS.

In meteorological observations there are a few important considerations to be well borne in mind and to be studied before we come to the actual work of observation. Too often in the past a neglect of these fundamental considerations has led to serious errors in observations, especially of the wind, and less frequently of temperature. It is well known that on clear nights, owing to intense radiation from the sod, its temperature is frequently lowered 15 or 20 degrees below that of the air immediately above it. This cooling of the air increases its density, and, if on a side hill, it begins flowing down to the foot of the declivity. As a result the cooler air fills up the valley at the foot, and, as this is sheltered from almost all wind effects, the air within becomes much cooler than the general air about. Now, as the temperature we seek is that of a somewhat extended region unaffected directly or indirectly by harmful radiation or reflection, it is evident that this condition can be fulfilled only by an exposure of the thermometer on a knoll, or at least away from a valley. Actual observation has indicated a temperature in a valley 15 to 20 degrees lower than that of the general air. In one instance a temperature at Washington was found 10 degrees lower in a valley than on a knoll 100 feet away. It is clear that no amount of expense for the immediate sheltering of a thermometer would obviate this difficulty, which is fundamental. The question of correct wind-direction and velocity depends, still more than that of temperature, on the surroundings of a station of observation. In this case we must expand our view, and take in the country for miles around. It is clear that no satisfactory observations of wind can be made in a valley, on a hillside, or in any situation where there are many hills around. If in locating a station it is found impracticable to avoid difficulty in this direction, then the observer should be cautioned against relying upon any local wind-vane, but should try to obtain the direction by the movement of smoke, a flag, or any other contrivance upon a neighboring eminence. As far as practicable, standard instruments should be used, and their accuracy determined by comparison with regular standards. Accurate instruments will be procured for observers at actual cost price; they will be compared with standards at this office, and correction cards furnished, free of charge. In these instructions there are given all necessary tables for use in reducing observations and making them available for direct comparison and use.

TIME OF OBSERVATION.

It is important in meteorological observations to select some uniform times each day for making them, especially of temperature and pressure, wind and clouds. It has been found, from actual hourly readings, that the hours best suited for determining general means at any station are 7 a. m., 2 and 9 p. m., but if it be found impossible to make observations three times each day, then they may be made at the two hours of the same name, that is, 8 a. m. and p. m., 9 a. m. and p. m., &c. In the case of rainfall it is best to measure the rain, whenever practicable, immediately at the close of the rain. If maximum and minimum or self-registering thermometers are used, the time of reading may be 9 p. m., or an hour earlier or later than that. In case there are no settled hours of observation, then at the close of the day there should be noted the general cloudiness and wind direction, with any facts of general interest, relating to frost, blossoming of trees, harvest, &c.

METEOROLOGICAL ELEMENTS TO BE OBSERVED.

The more important of these are: Air temperature, air pressure, humidity, rainfall, wind direction and velocity, thunder-storms, clouds, general observations of hail, tornadoes, aurora, and frost.

The more difficult are: Absorption and radiation of the sun's heat by the earth, evaporation, atmospheric electricity, height of clouds, and decrease of temperature with altitude.

There are also observations on the zodiacal light, solar and lunar halos, parhelia, paraselenes, and mirage, depth of ground frozen, closing of rivers, lakes and canals, and their rise and fall, temperature of the soil, of wells, and of springs, earthquakes, smoke of forest fires, dark days, hurricanes, time of budding, leafing, blossoming, ripening of plants, trees, grasses, &c., migration of birds, appearance of insects, &c., character of sunrise and sunset, and other phenomena that attract unusual attention, as the fall of fishes, frogs, &c., from the sky, red rain, &c.

TEMPERATURE OF THE AIR.

The words heat and cold express sensations familiar to every one, and need no explanation. The latter is simply the absence of heat and not a mode of energy. These sensations are largely dependent upon the state of our bodies, and hence we are forced to adopt some invariable instrumental means for determining actual values. Since heat expands most bodies, and its withdrawal contracts them, by suitable means we might

construct a heat measurer of some metal; or, better still, by the union of *two* strips of metal of different expansive coefficients, such as iron and brass. The art of making such heat indicators has been wonderfully perfected in these later days, and very accurate instruments are being made upon these principles. There is one serious defect, however, in all such contrivances, and that is their liability to change their indications in the lapse of time.

Since the volume of a gas or liquid would be changed by the application of heat, if we had some ready means of measuring this change of volume we would have a good measurer of temperature. Such an instrument is a gas or liquid thermometer in contradistinction to the one just described, which is a metallic thermometer. The gas or liquid thermometer consists of a bulb of some size, communicating with a tube more or less capillary in which the length of the column of gas or liquid is dependent upon the temperature of the bulb, hence affording an easy means of measuring changes of volume or temperature in the latter. The gas usually used is dry air, and the liquid either mercury or alcohol. The air thermometer is of great importance in obtaining a standard of thermometry, but is seldom used outside the laboratory.

THERMOMETER SCALES.

The two scales in common use are the Fahrenheit and the Centigrade. The former has its freezing point at 32° and boiling point at 212°. These are the fixed points of a standard thermometer, the first being the temperature of melting ice and the second that of boiling water. In the Centigrade scale these points are fixed at 0° and 100°. Since the interval between the two fixed points in the Fahrenheit scale is 180° and in the Centigrade scale 100°, it follows that 1°.8 Fah. is equal to 1.° Cent. To change the Centigrade degrees to Fahrenheit it is necessary to first multiply by nine-fifths and then to add 32°. In the reverse operation we must subtract from the Fahrenheit degrees 32°, then multiply by five-ninths. In other words—

$$F. = \tfrac{9}{5}\,C + 32^\circ \qquad\qquad C. = \tfrac{5}{9}\,(F. - 32^\circ)$$

Example: Convert 50° F. to C., we have:

$$\tfrac{5}{9}\,(50 - 32) = 10^\circ, \text{ hence } 50^\circ \text{ F.} = 10^\circ \text{ C.}$$

THERMOMETER CORRECTIONS.

It has been found that a thermometer, when graduated immediately after its manufacture, gradually changes its indications, continually reading higher and higher for several years. This may be obviated by allowing a thermometer to remain ungraduated for a term of years. After ten years the change from this cause will be practically ended.

In order to obviate the difficulty, Mr. Hicks, of London, passes the thermometers through a special treatment which eliminates the disturbing causes and produces a thermometer which has little or no liability to change. With an ordinary instrument it is necessary to determine the difference between its reading and that of a standard, and to apply that difference when great accuracy is required. Corrections are usually determined for each 10° of the scale, as follows:

Scale reading.	Correction.
°	°
—30	+1.0
—20	+0.4
—10	—0.2
0	—0.6
10	—1.1
20	—0.6
30	—0.4
32	—0.4
40	—0.3
50	—0.1
60	+0.1
70	+0.3
80	+0.5
90	+0.8
100	+1.1

This correction should be applied algebraically, as follows: At a temperature of —26° the correction would be +0.8, that is, the thermometer reads too low 0.8° —26.0+0.8= —25.2°. At —8° the correction is —0.3 or the reading is too high 0.3, hence —8.0—0.3= —8.3°.

It may be that as time passes the indications of a thermometer change. This can be best determined by placing the thermometer in melting chipped ice or snow and noting the reading at 32°. If it is different from that on the correction card, that difference should be applied throughout the scale. For example, suppose it be found in the case given above that the thermometer at 32° reads .6 too high instead of .4 (in this case)—0.2° should be applied algebraically throughout the scale. For example, at −30° the correction should be +.8, at 0° −.8, &c.

If it be found that a stem-graduated thermometer is apparently reading lower than before, then a more careful test in melting ice should be made, as it ought never to read permanently lower, though heating to its extreme height for a time will tend to depress the reading. The test in melting ice need not be made more than once each year, and in a very old thermometer not as often as that. A thermometer may sometimes be found in error from a break in the column of mercury or from a bubble of air in the bulb.

A thermometer to be in the best condition ought not to have its column broken when held with bulb uppermost. To remove the air the speck in the bulb should be first brought to the junction of the stem and bulb by jarring the latter in the open palm of the hand. When the speck is at the junction, prepare ice or snow or cold water and cool the bulb down, then invert it, and all the mercury will run to the other end, or may be made to do so by a gentle jar. Now heat the bulb, either in the hand or at a long distance from a heated surface, being careful to hold the stem horizontal or inclined, with the bulb end up. This will cause the mercury to rise and drive the air before it. Care should be taken never to heat so much that the top of the column is less than a half-inch from the end of the other, as otherwise the thermometer may be broken. If now the thermometer is held vertically the two columns will join, or may be made to do so by a gentle jar in the open palm of the hand; the air speck will be in the tube, but the mercury will join by a slender thread alongside of the speck. Now, if the bulb be cooled, the air-speck will remain stationary, but the mercury will flow past it toward the bulb.

By repeating the process the speck may be finally driven into the top of the tube, where it will do no harm. In cooling off the thermometer for the last time care should be taken that the speck in the column be at a point before inversion which is above the temperature of the cooling liquid, otherwise the column left after cooling down will be so short that it cannot be driven down on inversion. If it be found impossible to get the short column down on inversion after cooling, it may be easily lengthened by jarring the bulb in the open hand, holding the bulb down. In case there is much air separating the two columns it will be found impossible to unite them when the upper column is quite short, the air-speck being so large that the thread of mercury cannot pass it. In such case it may be necessary to heat the upper part of the tube, where there is no mercury quite hot. This expands the air and brings a slight pressure to bear upon the top of the mercury. If the thermometer while still hot be jarred upon the open hand the columns will frequently unite. If all other efforts fail take the tube from the brass scale and gradually heat the part above the main column in an alcohol flame, by running it back and forth in the flame and twirling it continually in the fingers, in order to heat it uniformly.

The mercury will be volatilized and scattered along the bore. Then by heating up the thermometer the main column will take up the various detached portions. Some thermometers are provided with an expansion chamber at the top of the tube, and in such case it is only necessary to heat the bulb until the air-speck has been driven into the chamber. After that, by holding the bulb down, on cooling it will be found that the air has remained behind and there is a continuous column of mercury. In the latter kind of thermometer it will frequently be found that a portion of the mercury has lodged in the chamber, and is entirely separated from the column in the tube. In such case a slight jar will sometimes send the mercury down. If this does not avail, then the bulb should be warmed till the column in the tube reaches the mercury in the chamber. When this is done, after cooling it will be found that the column is perfect. Sometimes the chamber becomes completely filled, and no effort can dislodge the mercury. In such case it is necessary to heat the chamber in an alcohol flame, being careful to turn the tube in the hand in order to apply the heat uniformly. In a short time the mercury will be expanded sufficiently to flow down the tube on its being held with the bulb down.

ERRORS OF ALCOHOL THERMOMETERS.

There are usually used alcohol thermometers for determining the lowest temperature of the night. These are susceptible to errors which often seriously affect their readings. This thermometer has usually for its liquid alcohol, in which there floats a glass index, which is carried down to the lowest point reached during the night by the capillary action of the end of the column and left there, the alcohol passing by the index as the temperature rises in the morning. Owing to the volatile nature of the fluid,

it is frequently evaporated and condensed at the upper part of the tube, thus causing a too low reading. In transportation, also, the column is often broken into a large number of parts. To unite the column, pass a small copper wire several times through the hole at the end of the brass scale, thus forming a loop. To this tie a strong string a foot or so long and rapidly swing the thermometer through a circle the radius of the string; continue the swinging until the operation is complete. Where the column is very badly broken it may be reunited by heating the bulb in water, gradually made hotter by adding hot water, until the end of the unbroken column reaches the expansion chamber at the top; if now the bulb is gradually cooled with the tube held vertically, bulb down, it will be found that there is a complete column. Another error sometimes occurs rendering the thermometer unserviceable, in that the index is stopped in the tube by some irregularity in the bore. If this occur often the thermometer will have to be returned to the maker.

SENSITIVENESS OF THERMOMETERS.

A series of careful experiments has shown that a cylindrical-bulb thermometer is much more sensitive to temperature changes than one having a spherical bulb. The difference is not noticeable in the determination of air temperature, but in the case of the wet-bulb thermometer (shortly to be described) it is a matter of much importance. To those supplying themselves with instruments it is suggested that it will be important to order cylindrical-bulb thermometers for dry and wet.

WET-BULB THERMOMETER.

This is precisely like the dry bulb, except that it has a piece of soft muslin tied over it, which is kept constantly moistened with rain or very clean water. Observations of the wet bulb for determining the humidity are attended with great difficulty, especially in the winter season, and if one desires to make them the most careful attention should be paid to the following points: It is not advisable to attempt such observations in a window shelter, unless there is some means of artificial ventilation. This may be done by means of a bellows connected with a rubber tube, which is carried to the wet bulb; the bellows should be fastened to the bottom of the shelter and should be manipulated by a cord over a pulley carried into the room, it being necessary to keep the window shut. Another convenient form of ventilation is by rapidly rotating the thermometer either on a horizontal or a vertical axis by means of suitable cog-wheels. Another simple method of ventilation may be arranged with a fan, movable by a lever, extending into the room or below the shelter if outdoors. Experiment has shown that a fairly open shelter (shortly to be described) will give entirely satisfactory results if there be any wind stirring; but when there is little or no wind, especially with the temperature below freezing, it will be necessary to wait a long time for the wet bulb to reach its lowest reading, say twenty to thirty minutes. In such case, artificial ventilation is a great convenience, and, if no other is available, a simple palm-leaf fan may be used in any except a window shelter.

The following process will enable any one to make a perfect-fitting muslin cover to the thermometer. It applies particularly to the cylindrical bulb, but may be used for the spherical also. First cut the muslin in rectangular form of sufficient size to lap over the bulb about one-eighth or three-sixteenths inch, then wet the piece and apply immediately to the bulb. The air bubbles may readily be pressed out, and there will be a perfect fit. Take a short thread and tie the muslin above the bulb, then another thread will enable one to draw the muslin tight by first making a loop and passing it over the projecting muslin at the lower end of the bulb and gradually drawing the muslin together with the loop. A fine needle and thread will now enable one to catch the edge of the muslin so that it can never be shifted. When the temperature is above 32° moisture may be drawn to the bulb by a short wick, having one end fastened to the top of the muslin and the other dipping in a reservoir of water. When the temperature is about to fall below 32° do not take off the wick, but simply remove it from the cup and pass its end up behind the thermometer, leaving the bulb in such a position as to enable one to immerse it in a cup of water kept as near freezing point as possible. If the wick be found frozen and stiff take a large dish of luke-warm water and thaw out the wick, and then place it as just directed.

In very windy cold weather it may be found necessary to immerse more than once in order to obtain a coating of ice that will not be evaporated too readily or before the lowest reading has been reached. If a wet bulb is well ventilated the lowest reading ought to be reached in a few minutes. The muslin should be changed whenever it gets brown, once in two months or so. In a very dry time it will be found that the wick running from the reservoir of water to the muslin ceases to act. In such case it is necessary to raise the reservoir in its clasp until the wick becomes nearly horizontal, when there will be no further difficulty. There is no danger of getting too much water on the wick.

Regnault found entirely satisfactory results even when the water dripped from the bulb. Great care should be exercised in keeping the bulb wet or covered with ice; a little practice will enable any one to tell at a glance whether the bulb is wet or not, though sometimes it may be necessary to touch the tip of the muslin with the finger in order to make sure of the fact. No masses of ice should be allowed to accumulate, but these should be melted off. If ice be found in the bulb left over from a previous observation, and the air temperature is above 32°, then all the ice must be carefully melted off before a correct reading can be had.

The most difficult time for making a correct observation of the wet bulb is when the temperature is just at or just below freezing. In this case extreme watchfulness is needed in order to avoid being deceived by the indications. When the bulb is first wet the mercury will go down somewhat rapidly, if the air be rather dry, until it may reach as low as 27°, when very suddenly the column will rise with rapidity, and will stand at exactly 32°. The error of a thermometer at 32° may be accurately determined by this observation. The second descent of the mercury will be found exceedingly slow, especially at the start, though when once fairly begun the column will fall quite quickly. Reading should only be made when the column has reached its lowest point. If one has artificial ventilation there will be far less difficulty. In this case it is necessary to ventilate only half a minute or so, then read and ventilate, and so continue the process till a stationary reading has been obtained or the column begins to rise.

MOISTURE OF THE AIR.

The moisture of the air may be expressed (1) by giving its amount in unit of volume and (2) by the ratio between the above amount and that required to saturate the air at the existing temperature. It is upon the second of these elements that our sensations of dryness and moisture chiefly depend, and it is this element which meteorologists have agreed to denote by the term *humidity;* or, as it is sometimes called, *relative humidity*. It is usually expressed as a percentage, *e. g.*, if the amount of vapor present is $\frac{7}{10}$ of that required for saturation the relative humidity is said to be 70 per cent. The humidity of the air may be regarded as the weight of aqueous vapor in a given quantity of air expressed as a percentage of the weight of vapor at saturation, which would occupy the same space, at the air temperature. Since aqueous vapor nearly fulfills Boyle's law, this humidity may be considered as the ratio existing between the tension of the vapor present in the air with the tension of saturated air at the actual temperature.

DEW-POINT.

The observation is familiar to every one of a mist forming on the outside of a glass of cold water. The density of this mist depends largely on the amount of moisture in the air. It is formed in the same way as dew at night, and indicates that the air near the surface of deposition has been cooled down until the temperature has reached the point of saturation, when immediately moisture or dew begins to deposit. This temperature is called the dew-point. If the cooling is produced by a freezing mixture which lowers the temperature of the side of the vessel below the freezing point the deposition is in the form of frozen particles or frost. An approximate prediction of frost may be made in the evening by determining the dew-point; as this remains nearly constant all night if in the evening of a clear calm night, with the air temperature at 40° or even 45°, the dew-point is found at 28° to 30° frost may be expected, especially in low lands. If such a cooling takes place in a mass of air then rain or snow may be expected, according as the dew-point is above or below 32°.

HYGROMETERS.

These may be divided into four general classes: (1) Hygrometers of absorption, or hygroscopes; (2) hygrometers of condensation, or dew-point instruments; (3) hygrometers of evaporation, or dry and wet bulb thermometers; (4) chemical hygrometers for directly determining the amount of moisture in a given volume of air.

Hair hygrometer.—The most important of the first class enumerated above is the hair hygrometer, which consists of a human hair from which all oily particles have been most carefully removed and afterward so attached to the spindle of a pointer as to indicate changes in length. This organic substance has the property of lengthening with the addition of moisture and one carefully prepared may be considered quite constant in its indications for a time. Such a hygrometer rapidly deteriorates, however, and if kept in a warm room will often take a set and give entirely erroneous results. To obviate this difficulty a hair hygrometer has been devised which may be readily brought in contact with saturated air; in this case it is possible to get a reading at each observation, or whenever desired, of the saturation point of the instrument. This instrument

has the merit of giving the relative humidity at a glance, and also of being much easier to use than the dry and wet bulb hygrometer (the psychrometer), especially with a temperature below 32°. It is almost the only instrument used in Russia under the latter condition, yet it must be admitted that it is entirely unreliable for accurate results and cannot be compared with a ventilated psychrometer. It should be noted that all methods of determining humidity become more and more difficult the lower the temperature falls below 32°, and no instrument yet devised obviates this difficulty.

Dew-point instruments.—A great variety of instruments have been devised for determining directly the temperature at which dew or frost will be formed. The best of these is Regnault's, which consists of a cup or prismatic box, having a highly polished face and so arranged as to permit of obtaining a very low temperature by the evaporation of a volatile liquid, such as ether, within the cup. A thermometer is inserted inside of the liquid, and its reading at the moment dew appears on the polished exterior will indicate approximately the dew-point temperature. When properly observed with a due regard to many intricate points, only to be learned by experience, this instrument may be made exceedingly accurate. The most difficult matters to arrange are: (1) Proper cleaning of the surface. (2) Position of ingress tube, as regards the thermometer. (3) Avoidance of floating vapors in the air, which would affect the plate. (4) Proper ventilation of the surface, &c. The instrument needs most careful manipulation, and can hardly be regarded as of practical use in making every-day observations in meteorology. It is most difficult to observe in low temperatures. These last remarks apply still more forcibly to the last class mentioned above—chemical hygrometers.

DRY AND WET-BULB THERMOMETERS OR PSYCHROMETER.

This instrument was first used by Saussure, and is the most practical instrument yet devised for obtaining the moisture contents of the air. It has been very seriously criticised. For example, R. H. Scott, in his Elemetary Meteorology, p. 106, says of it: "Close to and below the freezing-point the dry and wet bulb hygrometer fails." These criticisms are largely due to the fact that observations have been tried without a proper ventilation. Experiment has repeatedly shown that with a good ventilation the psychrometer yields entirely satisfactory results and is a most important adjunct to meteorological inquiry.

THEORY OF THE PYSCHROMETER.

The temperature of evaporation, or that given by the wet-bulb thermometer, has a certain fixed relation to the dew-point temperature, and having determined this relation, it becomes a simple matter to pass from the one to the other. Regnault proposed the following formula for expressing this relation:

$$x = f - A\,(t - t')\,p$$

in which $x =$ the vapor tension at the dew-point temperature.
$f =$ the vapor tension at the wet-bulb temperature, in saturated air.
$A =$ a constant to be determined by experiment.
$t =$ air temperature.
$t' =$ wet-bulb temperature.
$p =$ air pressure.

By a long series of experiments with a Regnault's hygrometer and sling psychrometer (shortly to be described) the value of A was determined as .00068. Another formula has been determined by Professor Ferrel from experiments which gives nearly identical results:

$$x = f - .000\,367\ p\ (t\text{-}t')\ \left(1 + \frac{t - t'}{1571}\right).$$

Experiment shows that there is no difference in the results whether the bulb be covered with water or ice. In order to make the above formula available for practical use it is necessary to prepare tables from which the necessary quantity may be taken after determining t and t'. A large number of tables have been devised for this purpose, giving the vapor tension, absolute humidity, dew-point, relative humidity, and dryness. The tables in this book are so arranged that all the above quantities may be obtained as one wishes. It has been decided to construct the table so that the dew-point and the relative humidity may be taken from it at a glance. The dew-point on many accounts is the most important element a farmer desires, and moreover, having given this, the vapor tension may be taken from the same table, and a small supplementary table will give the absolute humidity or grains of moisture per cubic foot. The so-called "dryness" of the air may also be obtained by subtracting the dew-point from the air temperature, though as this difference gives almost precisely the same result as the relative humidity both are hardly needed.

The variation of the dew-point with the air-pressure is slight up to 2,000 feet, and entirely within the errors of observation, yet if any one desires to apply this refinement it can be done by the use of the supplementary table. Instructions for the use of the tables and full illustration will be found immediately preceding the tables. (See p. 301.)

SELF-REGISTERING THERMOMETERS.

The use of maximum and minimum thermometers is very important, as it enables us to determine not only the highest and lowest temperature each day, but the mean of these two temperatures also gives nearly (not more than .2° to .4° above) the monthly mean temperature. The maximum thermometer, as commonly used in this country, consists of an ordinary instrument with its stem constricted near the bulb. This thermometer is placed in a position slightly inclined toward the bulb; while the constriction readily allows the mercury to pass with a rising temperature, yet it prevents all passage back to the bulb. The end of the column then indicates the highest temperature experienced during the twenty-four hours. In setting this thermometer for an observation it should be allowed to hang vertical, when a single stroke from the pin will cause the mercury to drop into the bulb. If this does not occur then the instrument must be grasped at its point of suspension and twirled rapidly. Care should be taken to see that the screw holding the thermometer upon the post is sufficiently tight to prevent the thermometer striking the board or any other projection near it.

The minimum thermometer should be hung nearly horizontal and should be set by tipping up the bulb end till the index reaches the end of the column. The end of the index nearest the end of the alcohol column is the one to be read. Care must be taken not to bring the hand near the bulbs of either the maximum or minimum thermometers in setting them. A comparison between the end of the alcohol column and the temperature of the dry-bulb should be made at the end of each month and entered on the record. The same may be done in the case of the maximum; that is, set the maximum and then compare, or else read both maximum and dry-bulb when the column is rising in both and record the comparison.

READING INSTRUMENTS.

In reading any and all instruments, whether thermometers or barometers, it is essential to bring the eye so that the line from the eye to the end of the column shall be horizontal. This is most important in case the thermometer is graduated only on the brass scale behind the tube, as a little variation in the position of the eye above or below the line of graduation will make a large difference in the reading. A little care should be taken in the reading to note exactly the number of degrees that the thermometer indicates. It has been found that frequently errors of 5° creep in from a want of care in this respect. A little practice will enable any one to split the degree into tenths; *i. e.*, to regard the space as divided into ten equal parts and to take the nearest tenth that the instrument indicates for record.

THERMOMETER EXPOSURE.

Suggestions have already been given as to the proper place, in any region, where exposures should be made in order to obtain general conditions over the region. Second in importance is the question of the immediate environment of the thermometer which shall be most likely to give the true air temperature. This question has been most carefully investigated, and the following suggestions are made for the guidance of all concerned:

(1) The most important consideration is as full and free natural ventilation as is possible. This is essential even if an artificial ventilation be employed for the dry and wet bulbs. Since the maximum and minumum temperatures are necessarily unventilated, the shelter itself should give accurate results for these.

(2) Provision should be made to avoid effects of direct solar radiation, and also of heat reflected and radiated from surrounding objects.

(3) Rain should be excluded but only, as far as possible, in connection with (1). During a rain-storm the dry and wet bulbs must necessarily give the same values, the air being saturated; hence a wetting at this time is not harmful.

(4) All permanent heating effects from warm walls, chimneys, &c., should be carefully avoided.

SLING PSYCHROMETER.

For values of dry and wet bulb temperatures the most accurate method yet devised consists in the use of dry and wet bulb thermometers fastened together and quite rapidly whirled by a string held in the hand or by means of a handle specially constructed. Any one may very readily prepare this instrument. The thermometers may be fastened back to back or side by side, the wet bulb an inch or so lower than the dry; then a rather strong wire or a good many folds of a thinner one should be passed through the hole at

the top of the scale, and to this a stout cord about 12 inches long should be fastened. A glove finger will serve to protect the finger while whirling. The method of use is very simple. First wet the muslin by immersion and wait about a minute till the wet bulb has fallen somewhat (this is specially necessary in a very dry air, as otherwise the muslin may become dry before it has reached its lowest reading), then whirl the thermometers about 50 times, stop and read the wet bulb, then whirl 20 times and again read. If the temperature of the wet bulb has not changed it may be considered as the correct value. If there has been a change to a lower reading continue the alternate whirling and reading until the wet bulb reaches its lowest reading or one slightly higher than the one previous. The lowest reading is to be recorded. A velocity of 12 feet per second is ample.

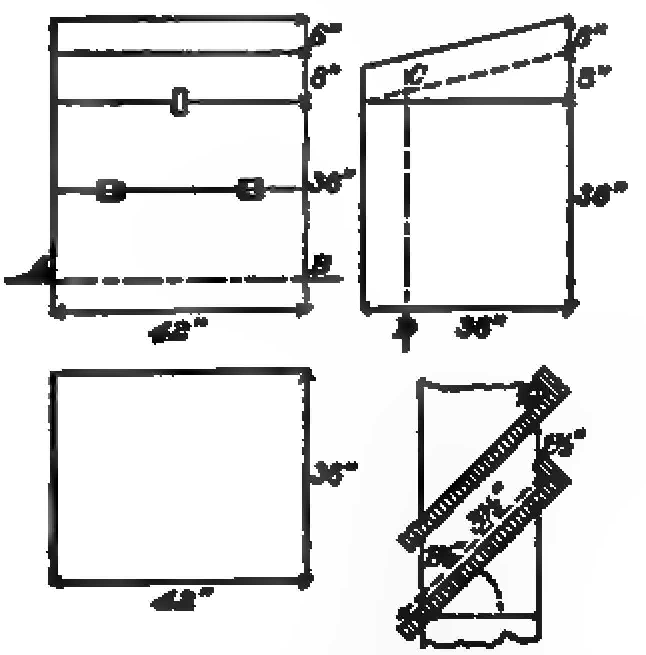
Great care should be taken never to allow the muslin to become dry or even partly so. At night the whirling may be done at any convenient spot where there is a good ventilation. The temperature should be taken at least 6 feet above sod or at any height greater than that. If there is a wind blowing the observer should stand to the leeward; if there is no wind, in cool weather, it may be necessary to walk about while whirling in order to overcome any possible vitiation from the heat of the body. When the sun is shining, in the daytime, the temperature should be taken in the shade of a small object, high tree, or even umbrella, but not in the shade of a wall or large house. The use of this instrument when the wet bulb is covered with ice is specially satisfactory. The lowest reading at any time may be obtained in three minutes, while with a rather close window shelter, when the air is still, it will require a delay of an hour for even an approximate value. This instrument is exclusively used in at least one European bureau.

FIXED SHELTER.

For maximum and minimum readings, and for use of those observers who regard the sling too troublesome, a fixed shelter is needed. The following drawings and specifications are for a shelter adopted by the Signal Service after several years' careful experimentation with different forms.

FIG. 1.

DESIGN FOR THERMOMETER SHELTER.



Scale 1" = 50" *Section thro' C.D. Scale 1" = 5"* *Section thro' A.B Scale 1" = 5"*

SPECIFICATIONS FOR THERMOMETER SHELTER.

The accompanying drawings give a general idea of the construction of the shelter, and the following description is added:

The frame to be cubical, 3½ feet long, 3 feet wide, and 3 feet high, of 2-inch pine, the corners to have 11 to 13 square inches cross-section. The top and bottom rails to be 2 by 3 inches. The bottom to be close, of five-eighths-inch pine. The roof to be double, of tongue and groove boards, joints white leaded, sloping 6 inches from front to rear, with 5 inches between the roofs; the inner of five-eighths inch, the outer of seven-eighths-inch pine. The front to have a door 15 inches wide, the length of the side, and to open down in front. The sides to be of blind work, the slats of white pine, 2¼ inches wide and one-quarter inch thick, to slope at an angle of 45 degrees to the horizontal. The distance from center to center to be 1¾ inches. Each slat to have a strip one-half inch wide and one-quarter inch thick nailed along its length on the inside, flush with the bottom. The frame to be made in four parts, and to be furnished with screws for putting together. The bottom to have one piece loose and hinged, so as to allow of dropping down, and a button to hold it up. Inside to have a frame for supporting the thermometers, consisting of two upright strips, 1 by 3 inches fastened to long strips screwed to the right and left rails of the frame, with a strip 1 by 2½ inches between those for the thermometers. The inside to have one good coat of white paint and the outside two coats. The wood to be well seasoned.

It will be noted that the first consideration mentioned above is nearly fulfilled in this shelter. The rain is excluded in all cases except with high winds and mists. This shelter should be exposed upon a free grass plat where there is no obstruction to the wind, and at a height of at least 10 feet above the sod. An exposure from the roof of a building is not objectionable, provided a platform 20 feet square be first laid and the shelter be raised 8 feet above the roof. The good ventilation of a roof is specially valuable. An exposure 4 feet above sod, especially among trees or where there is very little natural ventilation, is objectionable from the fact that under such conditions radiation from the sod into space abnormally cools the sod. and that in turn cools the air above it. This effect is specially active at and a few hours after sunset. The expense of such an exposure as that just described may deter many observers from adopting it, and in such case the following substitute is suggested:

WINDOW OR WALL SHELTER.

As its name implies this may be used from the inside of a house or it may be placed upon a wall and read from the outside; in either case the protection for the thermometers is the same and may be very easily prepared by any one. Ordinarily a wall—which should invariably be one looking due north or only a few degrees to the east or west—will give too low temperature by day, except possibly in winter, and always too high temperature by night. The reason for this is not far to seek. During the daytime a large wall does not gain the temperature of the free air but is nearly always below it, while the reverse is true at night.

These conditions are specially prominent in the case of a large brick or stone wall. The two effects above may be partly counterbalanced by the following considerations: First, the effect of the coolness of the wall by day may be offset by heat reflected and radiated from other walls or surroundings; second, the warmth at night may be offset in like manner by radiation to the sky. This will readily suggest a form of exposure adopted by many, one very easy to manage and having the least expense of any. Select a north window, preferably of an unoccupied room, especially in winter. Fasten the blinds open at right angles to the wall of the house in order to shield from the effects of the direct solar radiation on the north side both morning and evening. Fasten a narrow strip, perhaps 3 inches wide, across the window outside and from 8 to 12 inches from the window pane; to this fasten the thermometers. Some difficulty will be experienced in setting the maximum thermometer and in wetting the wet bulb if the room is occupied, as the heated air in winter will disarrange the readings of the self-registering thermometers. This may be partially obviated by opening the upper window and conducting all operations through it. In this case the heated air rises and does not affect the readings. If there is no wind, or if the wind is south, the greatest disadvantage arising from this exposure will be the lack of ventilation of the wet bulb. This may be partly obviated by working a fan hinged near the wet bulb and operated by a handle in the room.

PRESSURE OF THE AIR.

The Toricellian tube furnishes the means of measuring the amount of the atmospheric pressure at any moment; and this pressure may be expressed by the height of the column of mercury which it supports. Such an instrument is called a *barometer*. In order that its indications may be accurate, several precautions must be observed. In the first place, the kind of liquid used in different barometers must be identical, for the height of the column supported naturally depends upon the density of the liquid employed, and if this varies the observations made with different instruments will not be comparable.

The mercury employed should be chemically pure. The barometric tube is filled nearly full, and is then placed upon a sloping furnace and heated until the mercury boils. The object of this process is to expel the air and moisture which may be contained in the mercurial column, and which, without this precaution, would gradually ascend into the vacuum above, cause a downward pressure of unknown amount, and prevent the mercury from rising to the proper height.

h h' 30'

FIG. 2.

The next step is to fill up the tube with pure mercury, taking care not to introduce

any bubble of air. The tube is then inverted in a cistern, likewise containing pure mercury recently boiled, and is firmly fixed in a vertical position. This is a fixed barometer, and in order to ascertain the atmospheric pressure at any moment it is only necessary to measure the height of the top of the column of mercury above the surface of the mercury in the cistern. For this purpose an ivory point, the lower extremity of which is the zero of the scale, is fixed to the frame-work of the instrument, on the upper portion of which is the graduated scale and vernier. The mercury in the cistern is brought in contact with the ivory point and the vernier of the scale is adjusted to the top of the column; the reading of the scale will then give the height of the column of mercury.

Placing.—The barometer should be placed in a room of a temperature as uniform as possible, and not exposed to the sun. It must be suspended so that the top of the column will be at the height of the eye, near a window, in such a manner as to be lighted perfectly without exposure either to the direct rays of the sun or to the currents of the air which always take place at the joinings of the windows. When the barometer has to be fixed to the wall, as is the case with all the self-recording and some other barometers, care must be taken to secure the tube in a position perfectly vertical, regulating it by the plumb-line, first in the front, then at the sides, at least in two vertical planes cutting each other at right angles. When the instrument is so constructed as to take its equilibrium itself, as the Fortin barometers and those of J. Green, it is enough to hang it on a strong hook. These conditions being fulfilled, the rest of the arrangement may be varied according to the nature of the localities. For the Fortin and Green barometers the following arrangement is convenient, and may be almost everywhere adopted. (See Fig. 2.)

A small oblong box (*a b*), some inches longer than the barometer, and a little broader than its cistern, is firmly set against the wall (*w w′*), near the window, in such a manner as to open in a direction parallel to the panes; at the summit (*a*) it has a strong hook (*h h′*), which extends beyond the box about 2 or 3 inches, and on which the barometer is suspended. The instrument remains generally in the box, which is closed by a movable cover, and which protects it from external injuries, from dust, and from the direct radiation of warm bodies, or the currents of air from the window, and diminishes the effect of the too sudden variations of temperature. When it is to be observed, the barometer is taken by the upper end of the tube, and the suspending ring is made to slide towards the end of the hook. The instrument is then in the full light of the window, in front of which the observer places himself; the summit of the mercurial column, as well as the surface of the mercury in the cistern, are completely lighted, and the reading becomes easy and certain. Moreover, the slight oscillating movement impressed on the instrument, by changing its place, breaks the adherence of the mercury to the glass, and thus prepares a good observation. After the reading, the barometer is again slipped gently into the box, and this is closed.

It has been found that even with the exercise of care the barometer cistern strikes against the box when it is pushed in, and in consequence the instrument deteriorates quite rapidly. To avoid all possibility of injury from this cause it is only necessary to make two oblong openings in the back of the box, one just at the ivory point about 3 inches long, and the other at the vernier some 8 inches long, and place in these plates of glass. If now the barometer box be suspended vertically in a north window it will be a very simple matter, to make readings by opening the box and adjusting the mercury to the ivory point, and the vernier to the top of the column, without moving the barometer.

Observation.—Note the degree and the tenths of degrees of the thermometer attached to the instrument; for it will be seen that the heat of the observer's body soon makes it rise.

Incline the instrument gently, so as to render the mercurial column very movable; then, after having restored it to rest, strike several slight blows upon the casing, in such a manner as to impress on the mercury gentle vibrations. The adherence of the mercury to the glass will thus be destroyed, and the column will take its true equilibrium.

Bring, by means of the adjusting screw at the bottom, the surface of the mercury to the zero of the scale.

In the barometers with an ivory point, as the Fortin, Newman, and Green barometers, the extremity of this point is the zero of the scale, which must be brought into exact contact with the surface of the mercury. This takes place when the point coincides exactly with its image reflected below by the mercury. This method is very good when the surface of the mercury is perfectly pure and brilliant. It is generally dimmed by a slight layer of oxide, which makes the coincidence of the point with its image uncertain. It is safer to judge of the contact in a different manner. From the moment when the point does more than touch the surface, it forms around itself, by capillary action, a small depression, which, breaking the direction of the reflected rays, becomes immediately very easy to discover. It is enough, then, to raise the mercury so as slightly to

immerse the point; then to lower it gradually until the little depression disappears. If care is taken to make a good light fall on that portion of the mercury which is under the point, and to use the aid of a magnifier, the adjustment of the point thus made becomes not only easy, but very certain, and the errors to which we are liable are almost insensible, for they do not exceed two or three hundredths of a millimeter, or a thousandth of an inch.

The level being thus adjusted to the zero of the scale, proceed to observe the height of the summit of the column. Take hold of the instrument with the left hand, above the attached thermometer, without moving it from the vertical; tap it gently in the neighborhood of the top of the column; then, by means of the screw, lower the slide which carries the vernier, until the plane passing through the two lower opposite edges of it is exactly tangent to the summit of the *meniscus*—that is, the convexity which terminates the column. This is the case when, placing the eye exactly at the height of the summit of the column, the summit of the column is seen without there being any trace of light between the summit and the edge of the ring. To be certain that the barometer has remained quite vertical during its operation, leave it to itself, and when it is at rest, look again to see whether the ring has remained tangential to the summit of the column. If it has not, the verticality has been disturbed; it must be adjusted anew. It is necessary, at the same time, to examine if the adjustment of the surface of the mercury in the cistern has remained the same.

Nothing more, then, remains than to read the instrument. In the English barometers the inches and tenths of inches are read directly on the scale, the hundredths and thousandths on the vernier. In the French barometers, with the metrical scale, the centimeters and millimeters are read on the scale, and the fractions of millimeters on the vernier.

THE VERNIER.

The vernier is a contrivance for measuring fractional portions of one of the equal spaces into which a scale or, as commonly known, a limb is divided. It may seem a little difficult at first to learn to read a vernier, but careful attention to the following considerations will enable any one to read the most complicated. We will call the fixed portion of the barometer, which is divided into equal parts, the scale, and the part which moves upon it by means of the screw and ratchet, the vernier. A simple inspection will indicate the nature of the spaces or equal parts of the scale. In the common barometer these are inches and tenths, or centimeters and millimeters. Ordinarily the spaces on the whole length of the vernier are one more than on the part of the scale which it covers; *i. e.*, if the vernier has ten spaces the scale has nine in the same length. Determine the value of the smallest space on the scale (in the common Green barometer this is one-tenth inch), divide this by the number of spaces on the vernier, and we get immediately the *least count* of the vernier. We have then the following rule: The least count of a vernier is equal to one of the spaces of the scale divided by the number of equal parts on the vernier.

The reading of the instrument depends on the distance from the zero point or the beginning of the scale to the zero point of the vernier. If we take a vernier and make its zero point coincide with one of the divisions on the scale we shall find the second line exactly the least count of the vernier below the second line of the scale; or, in other words, if we move the vernier until its second line coincides with the one just above the first line on the scale, just referred to, we shall move the zero just the least count above its first position. In the same way the zero of the vernier may be made to coincide with other divisions on the limb, and the distance moved will depend on the number of the line on the vernier above its zero which is coincident with the line on the scale. We have then the simple rule for reading a vernier. Read the scale up from its zero, or in the direction in which the figures on the graduations increase up to that line of the scale just below the zero of the vernier. Call this the reading of the scale. Find the number of the line on the vernier, counting the first line above the zero as 1, which coincides most nearly with a line on the scale, multiply the least count of the vernier by this number, this will give the reading on the vernier; the sum of these two readings is the reading of the instrument.

These two rules will enable any one to read the most complicated vernier though he may never have seen it before. The description takes more time than the actual reading.

The observer is advised to test his ability to read the vernier by setting it at various points and then reading. After a time one reads the vernier naturally, without being obliged to follow any fixed rules. It will seldom occur that a line on the vernier exactly coincides with one on the scale, and after a little practice one will be able readily to split the least count; for example, if any two contiguous lines of the vernier lie between and exactly equidistant from two on the scale, the least count will be exactly halved. It is a very good plan, in order to avoid serious mistakes, at first to estimate the position of the zero line of the vernier on the scale, this will give the approximate value of the reading and will check the reading made from the vernier.

To read the vernier, we must look out for the line that coincides with one of the divisions of the scale. The number of this division of the vernier, proceeding from zero, indicates the number of tenths of millimeters, or of hundredths of an inch, which must be added to the whole number given by the scale. If none of the divisions of the scale coincides exactly, we estimate by the eye, in decimals, the quantity by which the vernier must be lowered to obtain a coincidence, and this is added to the fraction already obtained. This will be hundredths of millimeters in the metrical barometer, and thousandths of inches in the English barometers.

The following figures will serve as an example; the instrument is an English barometer:

In Fig. 3 the regulating line, which is the lower edge of the vernier ring, coincides exactly with the line of thirty inches on the scale. The zero and the tenth division of the vernier are also in exact coincidence; that is to say, there is no fraction. We shall read then 30.000 inches.

In Fig. 4 the regulating line does not fall upon any of the divisions of the scale, but between twenty-nine inches and two-tenths and twenty-nine inches and three-tenths of an inch. There is then a fraction which must be read on the vernier. Seeking which of these divisions coincides with that of the scale, we find that it is the fifth; we shall write then 29.250 inches.

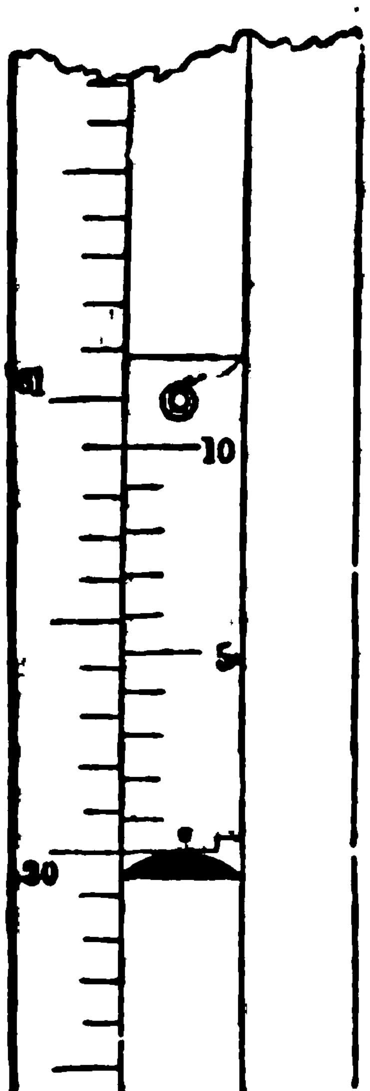


FIG. 3.

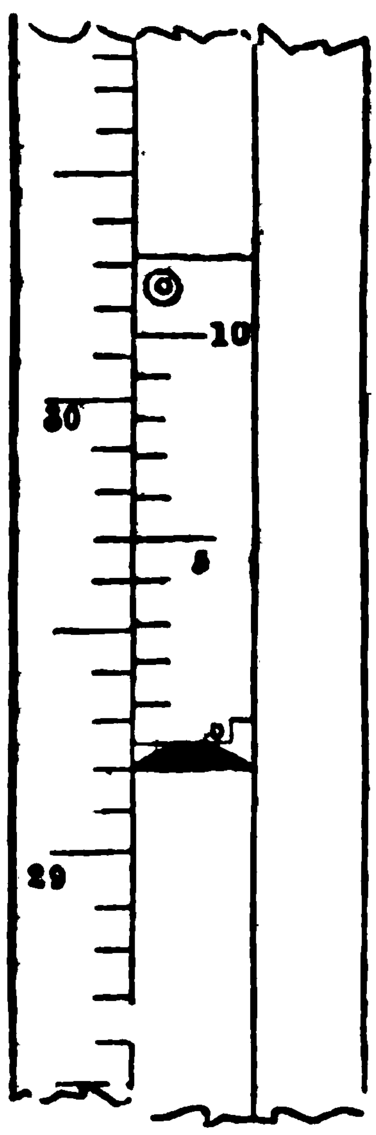


FIG. 4.

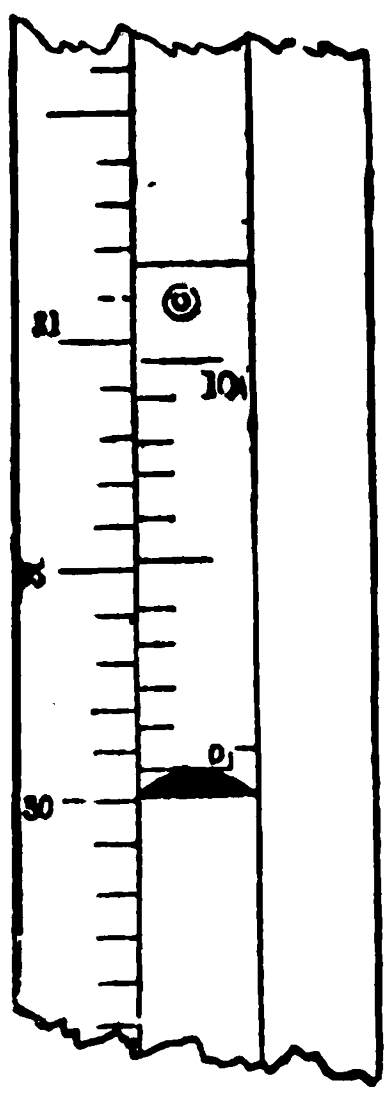


FIG. 5.

In Fig. 5 we see that the height falls between thirty inches and thirty inches and one-tenth; no line of the vernier also coincides exactly; but the line 7 is a little above, the line 8 is a little below, one of the lines of the scale; the fraction falls, then, between seven and eight hundredths. Estimating in tenths the distance the vernier passes over between the coincidence of seven and that of eight, the tenths of a hundredth, or the thousandths are obtained. In the latter case the distance above seven is less than the half; it will read then, 30.073. It will always be easy to judge whether the top approaches nearer the upper coincidence than the lower coincidence; in the former case the fraction is greater than .005; in the latter it is smaller than .005. The error which will be committed in this estimate will remain less than .005; with practice and a little skill it will hardly ever exceed .002, always supposing the scale is well graduated. For this reading, as well as for the others, it is particularly important to have the eye exactly at the height of the line to be determined.

During the whole time of the observation of the barometer the observer must endeavor to protect it as much as possible from the heat which radiates from his body. But the best way is to learn to observe rapidly. All the operations take longer to describe than to execute; one or two minutes, if the instrument be in place, three minutes, if it is to be taken from its case and put back again, are sufficient for a practiced observer to make a good observation.

STANDARD BAROMETER.

The following is a description of an improved standard barometer.

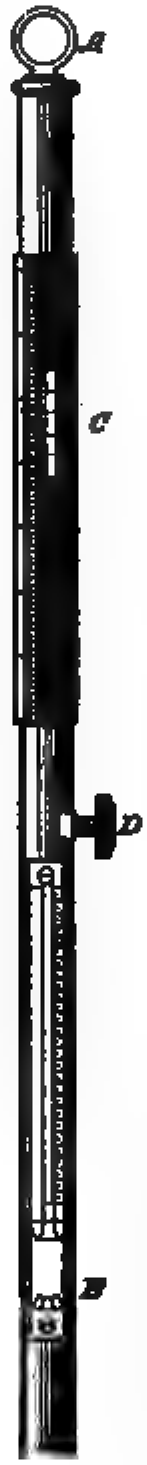


FIG. 6.

The barometer consists of a brass tube (Fig. 6) terminating at top in a ring A, for suspension, and at bottom in a flange B, to which the several parts forming the cistern are attached.

The upper part of this tube is cut through so as to expose the glass tube and mercurial column within, seen in Fig. 7. Attached at one side of this opening is a scale, graduated in inches and parts; and inside this slides a short tube C, connected to a rackwork arrangement, moved by a milled head D; this sliding tube carries a vernier in contact with the scale, which reads off to $\frac{1}{500}$ (.002) of an inch.

In the middle of the brass tube is fixed the thermometer E, the bulb of which being externally covered, but inwardly open, and nearly in contact with the glass tube, indicates the temperature of the mercury in the barometer tube, not that of the external air. This central position of the thermometer is selected that the mean temperature of the whole column may be obtained, a matter of importance, as the temperature of the barometric column must be taken into account in every scientific application of its observed height.

The cistern (Fig. 7) is made up of a glass cylinder F, which allows the surface of the mercury *q* to be seen, and a top plate G, through the neck of which the barometer-tube *t* passes, and to which it is fastened by a piece of kid leather, making a strong but flexible joint. To this plate, also, is attached a small ivory point *h*, the extremity of which marks the commencement or zero of the scale above. The lower part, containing the mercury, in which the end of the barometer-tube *t* is plunged, is formed of two parts *i j*, held together by four screws and two divided rings *l m*, in the manner shown in Figure 7. To the lower piece *j* is fastened the flexible bag N, made of kid leather, furnished in the middle with a socket *k*, which rests on the end of the adjusting screw O. These parts, with the glass cylinder F, are clamped to the flange B by means of four long screws P and the ring R; on the ring R screws the cap S, which covers the lower parts of the cistern, and supports at the end the adjusting screw O. G, *i*, *j*, and *k*, are of boxwood; the other parts of brass or German silver. The screw O serves to adjust the mercury to the ivory point, and also, by raising the bag, so as to completely fill the cistern and tube with mercury, to put the instrument in condition for transportation.

FIG. 7.

CORRECTION OF BAROMETRIC OBSERVATIONS.

Corrections must be applied to all barometer readings in order to bring the indications of different instruments into harmony with each other before they can be used for scientific purposes. Some of these corrections have reference to the special instrument, while others are applied to the reading of any instrument taken under the same conditions. The corrections of the former class are two in number:

I. Instrumental error.
II. Capillarity.

Those of the latter class are also two:

III. Temperature.
IV. Altitude above sea-level.

I. Correction for instrumental error. This is applied according to the error discovered in the individual instrument when compared with the standard. It is either additive (+) if the barometer reads too low, or subtractive (—) if it reads too high.

II. Correction for capillarity. The indications of barometers are affected by the capillary action between the glass tube and the mercury, the effect of which is constantly to depress the mercury by a certain quantity nearly inversely proportional to the diameter of the tube.

The correction, therefore, is always additive.

This depression is greater in tubes in which the mercury has not been boiled than in those which have been subjected to this process.

All barometers of the Signal Service allow for this by depressing the scale in each barometer just sufficient to offset the capillary action.

The certificates furnished from the Chief Signal Office for all barometers verified there give the results of direct readings of the column at different heights, and so include the corrections above mentioned, in so far as any of them are applicable to the special barometer under consideration.

Correction for temperature, or reduction to 32° F.—All bodies are affected in their dimensions by heat; with few exceptions they expand when their temperature rises and contract when it falls, and it is therefore necessary, in taking any accurate measure of the length of any object, to know at what temperature the measure was made, in order that we may know what the length would have been at some definite temperature, which is taken as the standard temperature. In the case of barometers this standard temperature is 32°, and accordingly when the barometer is at a temperature below 32°, considering only the mercurial column, the correction is additive (+), and when it is above 32° it is subtractive (—).

If the standard temperature for the brass scale were the same as that used for mercury, the sign of this correction would change from + to — at 32°, but the temperature of the scale is regarded as 62°; hence the sign changes at 29° instead of 32°. Many European meteorologists consider the scale to be at a temperature of 32°, and in this case the sign changes at that temperature.

The temperature of the barometer is given by the attached thermometer, the bulb of which is so placed as to give as accurately as possible the true temperature of the actual column of mercury.

The pressure is given in the table for each half inch from 24 to 31 inches, as of course the correction depends on the length of the column of which the temperature is given by the attached thermometer.

In consequence of the great risk of the heat of the observer's person affecting the thermometer attached to the instrument during the process of taking a reading of the barometer, the attached thermometer is always to be read first of all, before the reading of the barometrical column is made.

The table at the end of these instructions contains the correction to be applied to the readings of barometers mounted in *brass* frames, in order to reduce them to the normal temperature, 32°. It has been computed from the following formula given by Schumacher—

$$\text{Correction} = -h\frac{m\ (t-32) - s\ (t62)}{1 + m\ (t-32)}$$

in which

h=reading of the barometer,
t=temperature of attached thermometer,
m=expansion of mercury for 1° F., taken as .0001001 of its length at 32°,
s=expansion of the substance of which the scale is made; for brass s is taken as .00001041 of its length (h) at the standard temperature for the scale, viz, 62° F.

CORRECTION FOR ALTITUDE OR REDUCTION TO SEA LEVEL.

As we ascend in the atmosphere the air pressure gradually diminishes. At the height of Pike's Peak, 14,134 feet above sea level, the mean pressure is about 17.8 inches, at sea level it being 30.0 inches. In order then to make barometer readings comparable at different stations it is necessary to reduce them to a common plane. This has been assumed at sea level. This reduction depends upon the temperature of the outside air as well as the height of the station. It is important that each observer obtain as accurately as possible the elevation of his barometer, first, above a fixed point near its place of suspension; second, the elevation of the above fixed point above some plane, such as a railroad track at station, bench-mark on canal, level of the great lakes, or zero of river gauge; and, third, the elevation of such plane above sea level. The sum of these three elevations will give the elevation of the barometer above sea level. If it is found impossible to get the correct elevation in this way, an approximate value may be computed by means of barometric observations at the station compared with those made at the same time at a neighboring station the elevation of which is already known. As a general thing, however, it will be found feasible to obtain the elevation from a railroad track near the station. Table E at the end of these instructions will give the reduction for barometer readings at stations up to 1,500 feet; for greater heights a special table will be needed. This may be computed from the following formula:

$$\text{Log}\frac{h}{h'}=f\div\left\{60159\left(1+\frac{t+t'-64^{\circ}}{900}\right)\left(1+00268\cos 2\,l\right)\left(1+\frac{f+52251}{20886861}\right)\right\}$$

From a table of common logarithms, the natural number corresponding to log $\frac{h}{h'}$ is found; or $\frac{h}{h'}=n$, and $h=n\,h'$.

In this formula—

h and h'=barometer reduced to 32° F., at the lower and upper stations respectively,

t and t'=the temperature of the air at the respective stations,

f=elevation of upper station in feet,

l=latitude of the place.

SUBSTITUTES FOR MERCURIAL BAROMETERS.

Aneroids and metallic barometers are useful substitutes for the mercurial barometer.

The aneroid is an instrument which has come into extensive use, owing to its convenient size and portability. These recommendations have at once secured its very general adoption.

In the aneroid, atmospherical pressure is measured by its effect in altering the shape of a small, hermetically sealed, metallic box, from which almost all the air has been withdrawn, and which is kept from collapsing by a spring. The top of the box is corrugated.

When the atmospherical pressure rises above the amount which was recorded when the instrument was made, the top is forced inwards, and *vice versa*, when pressure falls below that amount, the top is pulled outwards by the spring. These motions are transferred by a system of levers and springs to a hand which moves on a dial like that of a wheel barometer.

The instrument must be graduated experimentally, as it cannot measure pressure absolutely, but affords indications relatively to a mercurial barometer (its sensibility depending *inter alia* on the quality of the metal of which the box is made).

The principle of the metallic (Bourdon's) barometer is somewhat similar to that of the aneroid.

Aneroids are very sensitive, but unfortunately they do not preserve their accuracy. If a table of corrections be determined for an aneroid, it will be found that after a time it has undergone some change, and that the values of the corrections will require alteration, so that recomparison with a standard barometer will be necessary. In every case of such comparison the readings of the mercurial barometer should be reduced to 32°, and standard gravity at latitude 45°.

A most serious objection to the scientific utility of these instruments is their liability to injury, owing to rust or to the alteration of force in the springs used in their construction. However, for the reasons above stated, the aneroid is especially suitable for fishermen, pilots, or sea-faring persons employed in boats or small coasting vessels, in which there is not space to suspend a barometer; and, of course, all that is stated regarding the barometer as a weather indicator, applies to the aneroid so far as a single observer is concerned. *For concerted observations accurate mercurial barometers are indispensable.*

PRECIPITATION.

A knowledge of the rain and snow fall of any locality is of great importance to the farmer, and each one should have a rain-gauge. By its use the gardener will be guided in determining the amount of moisture needed by his plants. The health and increase of domestic animals, the value of the crops, as well as the labors of the farmer, are dependent on the excess or deficiency of rain. Statistics of rainfall are very frequently called for in connection with crop production, sanitary arrangements in any town, and engineer operations, especially in the line of water supply. The hydraulic engineer must determine the rainfall in order to provide against floods in rivers and droughts on land. The observation of rain is one of the simplest imaginable, though one of the most difficult to make an estimate on. Some observers have sent in an estimate of 10 inches in a single storm; this is impossible except in very rare cases of cloud bursts. No *estimates* of rainfall should ever be recorded, but if an observer has no means of measuring rain, the record should be light (lt.), heavy (hy.), or very heavy (v. hy.). If one has no regular gauge, a pail with nearly vertical sides, a tub, or a simple tomato can should be used. An ordinary foot-rule or a yard-stick will measure the depth of rain after it has been caught. The following is a description of the rain-gauge used by the Signal Service. In the latest pattern adopted the edge of the receiver is very carefully turned from brass and the cylindrical reservoir is of drawn brass tubing, which makes the gauge very accurate.

RAIN-GAUGE.

The rain-gauge adopted for Signal Service stations consists of a funnel-shaped receiver, surmounted by a cylinder 1½ inches in length and 8 inches in diameter. The funnel is placed in a cylindrical reservoir 2.53 inches in diameter and 20 inches in height. The area of the cross-section of the reservoir is to that of the receiver as one to ten, or 1 inch of rain falling in the receiver corresponds with 10 inches of water in the gauge. The amount of rainfall collected in the gauge is measured by means of a graduated rod on which are marked inches and tenths of inches; 1 inch (10 spaces) on the rod corresponds to 0.1 (0.10) of an inch of rain, and 0.1 of an inch (1 space) on the rod to 0.01 of an inch of rain. To provide for very heavy rainfalls the guage is placed within an outer galvanized iron cylinder 6 inches in diameter and 23½ inches in height, and an opening is made in the top of the small cylinder of the gauge at the height of 20 inches. The gauge will then receive 2 inches (200 spaces, or 20 *lineal* inches on the rod) of rainfall, and when more than this falls the excess will flow over into the attached cylinder. To ascertain the amount of rain when it is in excess of 2 inches, first note the 2 inches in the small cylinder, then empty it, and pour into it the water in the outer cylinder; measure the amount, as already directed, add it to the 2 inches poured from the small cylinder, and the sum will be the total amount of rainfall.

SIGNAL SERVICE RAIN-GAUGE.

Fig. 8. Fig. 9.

DESCRIPTION.

A. Funnel-shaped receiver, area 50.30 inches.
B. Receiving reservoir, area 5.03 inches.
C. Overflow attachment.

In measuring the rainfall, as the inside reservoir has one-tenth the area of the receiver, the number of inches of water should be counted as tenths. Sometimes the measuring stick becomes slightly oily and in consequence the line of water will not be clearly marked; in such case draw the stick through the hand once or twice, and when again dipped in the water there will be found a very clear and well defined line of demarkation.

In many cases observers have had a gauge, similar to the above in size and shape, made from tin by a tinsmith, and afterward painted. Care should be taken in exposing the gauge to have it only 1 to 2 feet above a level plane, and at least the distance of twice the height of an object from it.

SNOW.

In measuring snow the best way in many cases is to take the outside overflow attachment and press it, mouth down, into new-fallen snow where it has not drifted, then by passing a thin shingle at the bottom of the snow a cylinder of it, the size of the overflow, may be taken up, melted, and measured as melted snow. In melting snow, the best way is to press the bottom of the gauge into a pail of rather hot water, and keeping it there till the snow has entirely melted. Care should be taken in all cases to enter the amount of snow unmelted in its appropriate column. The above method of obtaining melted snow is quite tedious, and the following will do nearly as well and even better if there is much drifting: Select a level plane of some extent and carefully measure the depth of freshly-fallen snow in at least three places where it has not drifted. If the three measurements nearly agree their mean will give the snowfall, and one-eleventh or one-tenth, according as the snow is light or heavy, will give an approximate value for the melted snow. If snow heavier than 10 inches to the inch of water falls it can almost invariably be measured in the rain-gauge as it must be almost melting, or at least not easily blown out of the gauge.

Most difficulty will be experienced in noting precipitation when rain changes to snow or *vice versa*. In the first case care should be taken to measure the rain and snow in the gauge as soon as it is found that the snow is being blown out or has filled the receiver, and after that only the snow should be measured, being careful not to measure any of the snow twice. The same precautions are needed when the reverse takes place, namely, snow turning to rain. This is a very difficult matter to give rigid rules upon, and each observer must depend largely upon his judgment in each individual case. The fall of rain or snow should be measured at the end of the storm, and a careful note of time should be made of the beginning and ending of the rain. In many cases it would be very interesting to have the time of beginning and ending of the heaviest rain.

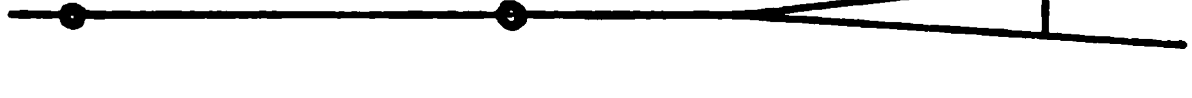
APPARATUS EMPLOYED FOR REGISTERING THE DIRECTION, PRESSURE, AND VELOCITY OF THE WIND.

The vane.—The instrument by which the wind's direction is most generally noted is the vane, or weather-cock, and all that need be said of it here is that the points north, east, south, and west, usually attached to it, should indicate the *true* and not the *magnetic* directions, and that care should be taken to prevent its setting fast. Very complicated instruments are required for ascertaining the pressure and velocity of the wind, and these are called *anemometers*.

Placing.—The *wind-vane* should be set in a place as free and open as possible, away from every obstacle, and especially from high buildings. It should exceed in elevation by at least 8 or 10 feet the neighboring objects.

As a flat vane is always in a neutral line, an accurate and sensitive one is made by fastening two plates together at an angle of about 10 degrees, forming a long wedge. Thus,

FIG. 10.



The longer the vane the shorter the pulsations, and the steadier the action will be. A small-sized vane may be 10 or 12 inches wide and 4 feet long.

Observation.—The observation of this instrument demands some care. In winds of considerable strength the vane is never at rest or fixed in the same direction; it oscillates incessantly, and its oscillations increase in amplitude with certain winds, and with the violence of the wind. We must then note the mean direction between the extremes. When the wind is very feeble perhaps it may not have sufficient force to set the vane in motion; in this case, as when the air is calm, great mistakes might be made by registering the direction marked by the index, for its position indicates not the direction of the existing wind but that of the last wind that had the power to set the instrument in motion. When the index is immovable and there is no oscillation we must give up its indi-

cations and refer to the movement of light bodies, as that of the leaves of trees and the smoke of chimneys, to determine the direction of these feeble currents of air. During the night the direction of the wind may be easily ascertained by raising the hand in the air with one finger wet. The least motion in the air increases evaporation, and a sensation of cold is experienced on the side of the finger turned towards the wind.

The *direction* of the wind must be noted, following the eight principal points of the compass—north, northeast, east, southeast, south, southwest, west, and northwest.

The lower or surface wind often has a different direction from that which prevails in the upper regions of the atmosphere, and this is generally the case when the wind turns and the weather is going to change, also during storms and great atmospheric movements.

The manner in which the wind turns, or rather the order in which the winds succeed one another in the course of the day, must be watched very carefully. It will be seen that they commonly follow in regular order; they pass from the east by the south to the west, and from the west by the north to the east. Nevertheless, they sometimes go back in the opposite direction, particularly during storms. A little memorandum, summing up in a few words at the end of each day this course of the wind, together with the hours of the wind's changes, is very valuable. It may be entered in the column of remarks.

The general appearance of the vane in use in the Signal Service and the location of the several parts are shown in Fig. 10. The iron straps which unite the two parts of the foot-block must be taken off and the block separated before raising the vane, in order to put the iron socket holding it in proper position. After the vane is up the pieces must be fastened firmly together again by these straps.

VELOCITY OF THE WIND.

The instrument generally used for determining the velocity of the wind is Robinson's anemometer, which consists of four hollow hemispherical cups mounted upon arms at right angles to each other, with the planes of their faces vertical and facing the same way around the circumference. These are placed upon a vertical axis, which has at its lower extremity an endless screw. The axis is supported so as to turn with as little friction as possible. The endless screw is placed in gear with a wheel which moves the two dials, which register the number of revolutions of the cups.

It has been proven, both by theory and experiment, that the center of any one of the cups so mounted and set in motion by the wind revolves with one-third of the wind's velocity. If, therefore, the diametrical distance between the centers of the cups be 1 foot, the circle described by the centers in one revolution is 3.1416 feet, and the velocity of the wind will be three times this, or 9.42 feet, which must be referred to time for the absolute rate. The instrument is sometimes made with the center of the cups 1.12 feet apart, so that the circle described is $\frac{1}{1500}$ of a mile in circumference. Hence, to produce one revolution of the cups, the wind must travel three times as fast, or $\frac{1}{500}$ of a mile. Therefore, 500 revolutions will be produced by one mile of wind.

The pattern of anemometer used in the Signal Service has the registering dials mounted concentrically. The outer dial has one hundred and the inner dial ninety-nine divisions. As the dials are moved by the the same wheel, they will move forward one hundred divisions in the same time (Fig. 11). The outer dial having one hundred divisions, the inner dial will complete one revolution and its zero be one division beyond or to the left of the zero of the outer dial when the outer dial has completed one revolution, the zeros of the scales coinciding at the time the instrument was set in motion. Thus the revolutions made by the outer dial are recorded on the inner one, the number of revolutions being shown by the number of divisions of the scale on the inner dial between the zero of that scale and the zero of the outer one. In taking the reading of the anemometer at any time the hundreds and tens of miles are read from the inner scale, and the miles and tenths of miles are read from the outer one. Take from the inner scale the hundreds and tens of miles contained between the zero of that scale and the zero of the outer one, and the miles and tenths of miles on the outer scale contained between the zero of that scale and the index of the instrument, and the sum of these readings will be the reading of the instrument at the time of making the observation.

When the anemometer is not furnished with an index-point the center of the small wheel which gives motion to the dials will be taken as the reference point.

The total movement for the twenty-four hours will be obtained in the following manner: Subtract the reading of the anemometer at 12 noon of the preceding day from the reading taken at 12 noon of the current day, and the difference will be the total movement of the wind. When the reading of the anemometer is less than the reading of the preceding day, 990 miles will be added to it, and the remainder, after subtracting the reading of the preceding day, will be the total movement.

Example: The dial reading of to-day is 91, and that of yesterday was 950, hence we have 91+990=1081; 1081—950=131, the total movement of the wind in miles during the past twenty-four hours.

Anemometers must be kept carefully and thoroughly oiled to prevent friction and injury to the several bearings. Especial attention must be given to the large dial-screw, and when found loosened it must at once be tightened, but care must be taken not to

FIG. 11.—ANEMOMETER DIAL.

screw it up tight enough to interfere with the free motion of the dials. Other instruments are in use which determine the force of the wind by measuring the pressure exerted upon a given surface.

The Vienna Congress has recommended the introduction of Professor Wild's pressure gauge, which is in use in Russia and Switzerland. This consists of a rectangular plate hung on hinges on a horizontal axis. The angle which this makes with the vertical indicates the force of the wind.

The pressure of the wind has been experimentally proved to vary as the square of the velocity, the relation being $P = .003\ V^2$. From this formula, therefore, the pressure can be calculated corresponding to the observed velocity.

The forms furnished voluntary observers have upon them a designation of the force of the wind on a scale of 0 to 10, but many have found it very difficult to use such a scale, and to such the following may commend itself; it is the scale largely used in Europe and is quite easy of application. In all cases where the observer uses this scale he should carefully write 0—6 in place of 0—10 on the form.

0. Calm.
1. Light; just moving the leaves of trees.
2. Moderate; moving branches.
3. Brisk; swaying branches, blowing up dust.
4. High; blowing up twigs from the ground, swaying whole trees.
5. Gale; breaking small branches, loosening bricks on chimneys.
6. Hurricane or tornado; destroying everything in its path.

CLOUDS.

The study of the forms and movements of clouds is of great importance in meteorology, for they afford the only means of knowing what changes are in progress in any part of the atmosphere above the lowest stratum. The very existence of a cloud, at any elevation, shows that the atmosphere is there in a state of saturation, and the lower the cloud the more humid is the atmosphere. The forms of the clouds may give information as to the changes of temperature and the cause of these changes, and their movements show what winds are blowing high up in the atmosphere and even the rate of their movement. If the height of the clouds is measured they serve as an accurate wind-vane and anemometer.

Cloud observations include their quantity, form, and movement.

Cloud proportion.—The proportion of the sky covered by clouds may be determined by simple inspection. A sky wholly overcast is recorded as 10, and all minor degrees of cloudiness by the lower numbers, 0 being used to indicate less than one-twentieth of cloudiness. Of course, only an approximate estimate is possible, but with a little practice this may be made sufficiently accurate for practical requirements. It may assist beginners in making this estimate, to notice that if the sky be divided into five triangular segments by five equidistant lines drawn from the zenith to the horizon, each of these will be divided into two nearly equal parts by a line parallel with the horizon, and at one-third the distance between it and the zenith.

CLASSIFICATION OF CLOUDS.

The most important are the three primary forms, cirrus, cumulus, and stratus, and the combinations cirro-cumulus, cirro-stratus, cumulo-stratus, and nimbus.

Cirrus.—Clouds composed of loose, parallel or divergent fibers, looking like hair or feathers, but varying greatly in form. It is a very lofty cloud, sometimes attaining the height of 10 miles. It is usually of very small density, and is probably composed of minute snow crystals, because the phenomena of halos are produced by them which can only be explained by the refraction of the rays of light through ice crystals. The motions of the cirrus often differ in direction from those of the surface-winds, showing the general movements of the upper strata of the atmosphere, and are often indicative of coming changes.

Cumulus.—Convex or conical heaps increasing upwards from a horizontal base. These are dense in structure and of a round or globular form, and are often called "cotton-bale." They are formed in the lower atmosphere and move with the current close to the earth. They are formed by ascending currents of warm air rising from the heated ground until, becoming cooled below the dew-point, it condenses into visible cloud. The rounded top results from the fact that an ascending current is stronger near its center than at its external parts and carries up the vapor to a greater height. In fair weather the cumulus often form a few hours after sunrise, go on increasing until the hottest part of the day, and generally disappear about sunset, though they may continue through the night. They sometimes take the form of rolls.

Stratus.—A widely-extended continuous horizontal sheet, increasing from below upward. This is generally a fine-weather cloud, appearing at night and morning of the brightest days. It is a layer or horizontal sheet of uniform thickness, appearing at a distance like a streak on the horizon. It generally forms about sunset, grows denser during the night, and vanishes at sunrise. It is caused by the vapors which have risen during the day, and which, as the ascending currents become weaker toward evening, approach the earth. As the cooling of the air during the night begins near the ground, and thence proceeds upward, the condensation of the vapor first appears near the ground

and thence increases from below upward as the successive layers of air become cooled below the dew-point. Descending smoke and dust contribute to the density of stratus clouds.

Cirro-cumulus.—Small, well-defined roundish masses in close horizontal arrangement or contact. This is also a high cloud, though usually at a lower level than the cirrus, from which it differs in being more globular in form as it consists generally of small detached rounded masses, like a flock of sheep lying down. When at a low level it may be difficult to distinguish these clouds from small cumuli. It occurs very frequently in summer, particularly in dry and warm weather.

Cirro-stratus consists of delicate fibrous clouds spread out in strata, which are either horizontal or but slightly inclined to the horizon. This cloud appears to result from the subsidence of the fibers of the cirrus to a lower level. Sometimes the whole sky is so mottled with this cloud as to resemble the back of a mackerel—"mackerel sky." The cirro-stratus precedes wind and rain, and is almost always to be seen in the intervals of storms. It should be noted that the term "mackerel sky" is applied to the cirro-cumulus in England and other countries, and there indicates fine weather, but in the United States it is regarded a foul-weather cloud.

Cumulo-stratus.—This has for its base a horizontal layer or stratum from which rise large overhanging masses of cumulus. It is the cumulus changing into the nimbus.

Nimbus.—A cloud from which rain is falling. It is generally composed of different clouds which are so blended that it becomes impossible to distinguish them.

The term "Scud" indicates loose, detached clouds drifting rapidly before the wind.

CLOUD MOVEMENT.

The great difficulty in getting at the true direction of cloud movement lies in the effect of perspective. The following device eliminates this:

"Set up a pointed pole, reaching 6 or 8 feet above the observer's head, and through the top, an inch or so below the point, fix two stout cross-wires, or thin iron rods, set truly by compass to the four cardinal points. The space around the pole must be sufficiently open to allow of a good view of the sky in all directions. Let the observer then station himself at such a distance from the pole, and in such a position that some recognizable limb of a cloud appears to move vertically upward from the top of the pole or vertically downwards toward it. The direction of the pole from the observer's position (which may be judged of accurately by means of the cross-wires on the top) is the direction of the cloud's true movement. With a little care in selecting the position the pole may be dispensed with, as any pointed object will serve the purpose, provided the observer has previously acquainted himself accurately with the points of the compass. The velocity of cloud movement may be measured in favorable situations by observing the time that the shadow takes to traverse a certain space of country, the extent of which is accurately known."

The direction from which the clouds are moving should be recorded to 8 points N. NE., E., &c. The velocity may be recorded by the letters s slowly and r rapidly placed as an exponent to the direction thus, N^r, S^s.

Haze, smoke, and fog should be recorded as such, with the addition of the words "light" or "dense," as the case may be.

STATE OF THE WEATHER.

Clear, when the sky is $\frac{3}{10}$ or less obscured; fair, when the sky is from $\frac{4}{10}$ to $\frac{7}{10}$ obscured; cloudy, when the sky is more than $\frac{7}{10}$ obscured; light rain (lt. r.), when there is light rain; heavy rain (hy. r.), when there is heavy rain; in like manner with light and heavy snow, substituting s for r; fog, haze, smoke, according as these are predominant.

FROST.

Occurrence of first and last frost of any growing season should be specially noted as well as all killing frosts during the same.

CORONÆ.

These must be distinguished from halos. Coronæ are very common, specially around the moon, and are produced by the rays passing through a thin layer of cloud. Sometimes as many as three small concentric circles may be seen whose diameters are in the ratio of 1:2:3. They are frequently colored, red being the outside color. These colors are not the pure colors of the spectrum, but rather those of the opal, and are caused by interference and not refraction. A solar corona is not often visible on account of the dazzling brightness of the sun, but it may often be seen by viewing the sun through colored glass, or noticing the reflection in the water.

Halos are large circles of 45° or 92° in diameter. That is, the diameter is equal to one-eighth or one-fourth the circumference of the horizon. Both are seldom seen at the same time. The colors are very feeble, generally approaching whiteness. Halos arise from the presence in the atmosphere of minute prisms of ice and consist of refracted light. Sometimes the halo is intensified into two bright spots, one on each side of the central luminary. These are called "parhelia" or "paraselenæ" (mock suns or mock moons). Still more complicated phenomena are sometimes seen, through rarely, except in high latitudes.

THUNDER-STORMS.

Thunder-storms six hours apart may be taken as separate storms.

Upon the occurrence of thunder, give as nearly as possible the time of first, loudest, and duration of thunder (being careful to note a. m. or p. m. if the hours 0 to 24 are not used). Frequently when a storm has passed there will be muttering of thunder, but a little observation will show when a storm has really passed.

Give the direction from which the storm appears to be coming, as shown by threatening sky, lightning flashes, or thunder peals. Also, the direction toward which it goes.

It is proposed to attempt the use of a scale to indicate the approximate intensity of the storm. This is confessedly a very difficult matter to decide upon, but it is much needed in order to have a means of comparison of storms in future, and the following is suggested for trial:

1. Distant lightning (the number is not needed in this case).
2. Distant thunder.
3. Moderate thunder-storm.
4. Heavy thunder-storm.
5. Heavy thunder, with very high wind breaking small branches off trees, &c.
6. Thunder with hurricane or tornado.

TORNADOES AND LAND-SPOUTS.

These whirlwinds, or violent and circumscribed storms, give rise to very complex phenomena, which are difficult to observe. All the meteorological circumstances, however, should be minutely noted; among others the following:

The course of the barometer, which almost always sinks much and rapidly; that of the thermometer, which usually indicates an elevation of temperature; the region of the heavens in which the thunder-storm frequently accompanying them is formed; the form and color of the clouds; the direction and intensity of the wind; the frequency, size, and form of the lightning; finally, the apparent shape of the land-spout, its variations, its course, and its effects upon the trees and upon the ground.

ADDITIONAL OBSERVATIONS DURING STORMS.

Everybody knows the importance of a knowledge of the laws of those great movements of the atmosphere which embrace almost the whole extent of the continent. It is only in following them, step by step; by observing their different phases at different places, and by combining the facts obtained, that the meteorologist can be enabled to discover the laws which preside over these great phenomena. For this the three regular observations a day are insufficient; it is then earnestly recommended to observers, who desire to contribute effectually to the solution of this great problem, not to content themselves with the prescribed number, but to add as many more as possible during the continuance of remarkable storms; noting not only the state of the instruments from hour to hour, if possible, but following with attention all the meteorological changes. These observations must be entered on the reverse of the sheet, under the head of "Casual Phenomena," which is particularly reserved for this purpose.

The principal points to which attention should be directed are the following:

The barometer announces, by a considerable fall, the approach of a storm. Then it begins to rise during its continuance, and only resumes its normal equilibrium after its close. Note especially the following points:

Was the storm preceded by a noticeable or sudden rise previous to the fall;

Note the state of the barometer, and the time when the fall becomes more rapid;

Its state, and the time, when it is lowest and when the rise begins;

The highest point which it reaches during or immediately after the storm.

If alternations of rising and falling take place, the fact should be mentioned and the time noted.

The thermometer.—The fluctuations of the thermometer in the same time as those of the barometer should also be noted, and their connection with the changes of the wind be observed.

The wind.—It is of the greatest importance to observe the course of the winds through the entire height of the atmosphere during the whole continuance of the storm, by means of the wind-vane and of the clouds in the different layers of the atmosphere.

The hour when the wind begins, and the direction whence it comes;

The moment of its greatest violence;

The instant it changes its direction, and when it takes the direction it keeps to the end of the storm.

It should be stated if the wind blows in a continuous manner or in squalls, and what is its force.

If there should be one or more moments of calm, the hour and duration will be indicated.

Great care must be taken at each observation to note also the direction of the different layers of clouds, which will very often be found different from that of the wind below, for the whole duration of the storm.

The clouds.—Are there certain forms of clouds which announce the approach of a storm? It is necessary, in this connection, to watch the formation of the cirrus, the cirro-cumulus, cirro-stratus, their arrangement in parallel lines, their course, and their direction. Note the quarter of the sky first covered with clouds; the moment when it is entirely covered; if there are later clear spots or not; the moment when the sky clears off.

The rain.—Note the hour at which the rain or the snow begins and ends; measure the quantity fallen while the storm lasts.

INSTRUCTIONS FOR OBSERVING AURORAS.

Though the aurora borealis has received attention during a considerable portion of the last two centuries, definite information is still wanting on several points which may serve as the basis of a sound induction as to its cause. These relate particularly to the actual frequency of its appearance; its comparative frequency in the different months of the year and different hours of the day; the connection of its appearance with other atmospherical phenomena; the elevation and extent of visibility of the arch; and whether the same or different phases are presented to individuals at different stations at the same moment of time; finally the precise influence of the arches, streamers, &c., on the magnetic condition of the earth; and whether any unusual electrical effects can be observed during the appearance of the meteor.

Auroral phenomena may be divided into the following classes:

1. A faint light in the north, without definite form or boundary.
2. A diffused light, defined by an arch below.
2. Floating patches of luminous haze—sometimes striated.
4. One or more arches, resembling the rainbow, of uniform white color, retaining the same apparent position for a considerable time, and varying in luminosity.
5. A dark segment, appearing under the arch.
6. Beams, rays, streamers, waves, transverse and serpentine bands, interrupted or checkered arches, frequently tinged with color, and showing rapid changes in form, place, and color.
7. Auroral corona, or a union of beams south of the zenith.
8. Dark clouds accompanying the diffuse light.
9. Sudden appearance of haze over the whole face of the sky.

The following may serve as a scale of brightness: (1) Faint; (2) Moderate; (3) Bright; (4) Very bright.

GENERAL DIRECTIONS.

1. Make a regular practice of looking for auroras every clear evening, from 8 to 10 o'clock or later. Record the result, whether there be an aurora or not.
2. Note the time of observation, and compare the watch used with a good clock, as soon after as is convenient.
3. Make a return of the latitude and longitude of the station.
4. Note the class to which the auroral phenomenon belongs.
4. If it be an arch, note the time when the convex side reaches any remarkable stars, when it passes the zenith, disappears, &c.
6. If the arch be stationary for a time, note its position among the stars, so that its altitude may be determined.
7. If it be a streamer or beam, note its position, and the time of its beginning and ending.
8. If motion be observed in the beams, note the direction, whether vertically or horizontally, to the east or west.
9. Note the time of the formation of a corona, and its position among the stars.

10. Note the time of the appearance of any black clouds in the north near the aurora; also, if the sky be suddenly overcast with a mist at any time during the auroral display.

11. Give the direction and force of the wind at the time.

12. Note if any electrical effects are observed.

13. Note the effect upon a delicately-suspended magnetic needle.

14. The date, hour, and minute of the beginning and ending of auroras should be carefully noted, as well as the azimuth and altitude of each extremity and of the crown of any arch of light, and the same data for any corona or glory that may be formed.

When the observer is familiar with the names of the principal fixed stars, he may locate the arch or crown by reference to them, but it is preferable that he should observe directly the altitude and azimuth.

Altitudes are expressed by degrees from the horizon to the zenith.

If any circle be divided into three hundred and sixty parts, and the radial lines connect these parts with the center, each pair of lines subtend an angle of one degree; the fourth part of the circle will subtend to an angle of ninety degrees or one right angle, and the corresponding radii are perpendicular to each other; thus the zenith (that point of the heavens immediately above the observer) is ninety degrees from the horizon, or, in other words, its altitude is 90°. A point half way up from the horizon to the zenith has an altitude of 45°.

Azimuths are also expressed in degrees, but are measured on the horizontal plane, and will be recorded as is done in astronomy, from the south point to the westward, passing, successively, the west, north, and east points of the compass until 360° have been passed over, and the south point is again reached.

Observers should be particular as to the date of the aurora; and when it begins in the evening of one day and continues into the early morning of the next day, it will be entered as occurring on the *first* day, but its details will be given in the record as occurring between the hours of its actual beginning and ending. Thus, an aurora that began on the evening of the 12th of January and continued until the early morning of the 13th would be entered as the aurora of the 12th, but its details would be recorded as occurring, for instance, between the hours of 10 p. m. of January 12 and 2 a. m. of January 13.

Professor Olmstead, in a paper published by the Smithsonian Institution, classifies different auroras as follows:

"*Class I.*—This is characterized by the presence of at least *three* out of four of the most magnificent varieties of form, namely, arches, streamers, corona, and waves. The distinct formation of the corona is the most important characteristic of this class; yet, were the corona distinctly formed, without auroral arches or waves, or crimson vapor, it could not be considered as an aurora of the first class.

"*Class II.*—The combination of *two* or more of the leading characteristics of the first class, but wanting in others, would serve to mark class the second. Thus the exhibition of arches and streamers, both of superior brilliancy, with a corona, while the waves and crimson columns were wanting, or of streamers with a corona, or of arches without a corona, without streamers or columns (if such a case ever occurs), we should designate as an aurora of the second class.

"*Class III.*—The presence of only *one* of the more rare characteristics, either streamers or an arch, or irregular coruscations, but without the formation of a corona, and with but a moderate degree of intensity, would denote an aurora of the third class.

"*Class IV.*—In this class we place the most ordinary forms of the aurora, as a mere northern twilight, or a few streamers, with none of the characteristics that mark the grander exhibitions of the phenomenon."

The same author remarks:

"On the evening of the 27th of August, 1827, after a long absence of any striking exhibition of the aurora borealis, there commenced a series of these meteors, which increased in frequency and magnificence for the ten following years, arrived at a maximum during the years 1835, 1836, and 1837, and, after that period, regularly declined in number and intensity until November, 1848, when the series appeared to come to a close. The recurrence, however, of three very remarkable exhibitions in September, 1851, and of another of the first class as late as February 19, 1852, indicates that the close was not so abrupt as was at first supposed; but still there was a very marked decline in the number of great auroras after 1848, and there has been scarcely one of the higher class since 1853.

EARTHQUAKES.

The Chief Signal Officer is desirous of collecting information in reference to all phenomena having a bearing on the physical geography of this continent; and it is requested that observers will furnish any information which they may possess, or be able to obtain, in regard to earthquakes occurring in their neighborhood.

It will be interesting to determine the geographical limits of the disturbance, and to ascertain whether it was confined to any particular geological formation. If the direction

of the shock was observed at a few places, the center of commotion could be determined; and if the time were accurately known at different points, the velocity of the earth-wave could be calculated. Hence, an answer is requested to the following questions, viz.:

1. Was the agitation felt by yourself, or by any other person in your vicinity?
2. What was the approximate time of the occurrence?
3. What was the number and duration of the shocks?
4. What was the direction of the motion?
5. What was the character of the disturbance; was it vertical, horizontal, or oblique; was it an actual oscillation; an upheaval and depression, or a mere tremor?
6. Was there any noise heard; and if so, what was its character?
7. Was the place of observation on soft ground, or on a hard foundation near the underlying rocks of the district?
8. Were any facts observed having apparently an immediate or remote bearing on this phenomenon?
9. What was the intensity of the force in reference to producing motion in bodies and cracks in walls?

NOTE.—Please reply to the *first* question, if to no other; for an answer to it is necessary, in order to determine the limits of the commotion.

The direction of the impulse may have been ascertained by observing the direction in which molasses, or any viscid liquid, was thrown up against the side of a bowl. The remains of the liquid on the side of a vessel would indicate the direction some time after the shock occurred.

GENERAL PHENOMENA OF CLIMATE.

Phenomena of a general character, of which the date of appearance cannot be mistaken, are very valuable. Series of years have in some cases been carefully observed, which would greatly add to the value of the current record, if forwarded with it. The following are of this class:

1. Breaking up of ice in large rivers or bays.
2. Date of greatest rise and lowest fall of water in large rivers, especially when periodic, as in parts of the interior.
3. General leafing and fall of leaf in decidious forests. In most parts of the North and the interior, these are well marked and easily designated periods.
4. Beginning of growth and the end of growth or destruction of grasses in general, as on plains or prairies.
5. First growth, flowering, and maturity of important annual staples, with their period in days from the beginning to the end of vital action.

Voluntary observers are requested to include in their monthly reports all reliable information relative to the destruction of life and property coming to their knowledge, classifying it, as far as possible, as indicated in the following table:

Date of storms.	Nature of storms (tornado, northeast gale, &c.).	Section of country traversed by storm.	Number and names of persons killed.	Number and names of persons injured.	Number and names of vessels lost or damaged, with estimated amount of loss.	Number of houses, [illegible] rbuild- [illegible] rdam- [illegible] imated [illegible] amount of loss.	Estimated amount of damage to property.	Number of animals killed, and estimated value.

SPECIAL DIRECTIONS TO THE VOLUNTARY OBSERVERS OF THE SIGNAL SERVICE.

In the reduction of the meteorological records presented to this office, much additional labor has resulted from the occasional omission in the records of some important facts, and in a want of perfect uniformity in noting the phenomena. To insure uniformity in the records attention is called to the following remarks:

1. *Failure to record latitude and longitude, name and station of the observer, and date on each sheet;* the observer probably supposing it sufficient to insert them *once* on the first sheet sent, and so omitting them afterwards. This often renders it necessary to search back through all the series of registers to some one that contained them—perhaps in a former year. *They should be inserted on every sheet.*

2. *Designating the same place by different names*, thus rendering it impossible to distinguish whether it was one place or two, unless by accidentally noticing the similarity in the name of the observer or in the latitude and longitude. Such changes of name should be avoided when practicable; and when necessarily made, special attention should be called to it.

3. *Diversity in the mode of recording the barometer*, as follows:

(*a*) Integers record *in full*, thus 29.35. (THIS *is the proper mode.*)
(*b*) Integers omitted when the same as in the entry *next above*, thus 38.
(*c*) Integers omitted when the same as in the entry *next to the left.*
(*d*) Integers omitted when the same as in the entry next preceding in the order of time.
(*e*) Integers omitted, except where they are different from the usual ones at the place of observation.
(*f*) Integers inserted occasionally and apparently without any system whatever.
(*g*) A *constant* suppressed, and the excess or deficiency recorded, as + or —.

The proper mode is that indicated by (*a*).

4. *Diversity in the mode of recording the thermometer, when it is below zero*, as follows:

(*a*) Indicated by the sign minus — placed before it, thus — 16°. (This *is the proper mode.*)
(*b*) Indicated by the same sign placed *after* it thus, 16°—.
(*c*) Indicated by writing it under a zero—thus $\frac{0}{16^\circ}$.
(*d*) Indicated by writing it after a zero, with a comma between, thus, 0,16°.
(*e*) Indicated by the *word* "below," or the abbreviation *b* written before or after it—thus 16° below, 16° b, b 16°, or below 16°.

The first (*a*) is the proper mode.

5. *Departure from the printed instructions in recording the degree of cloudiness*, some observers reversing the figures and using **10** to denote a clear sky, and **0**, one entirely overcast; and others omitting the record altogether in the columns of cloudiness when the sky is clear, and in place of it sometimes inserting the word "*clear*" in the columns of "remarks," or elsewhere. Both lead to error, and should be avoided—the zero should always be inserted "in the narrow column," as directed, when the sky is clear.

6. *Diversity in the use of the character* (0) *in recording the motion of the clouds*, as follows:

(*a*) Used to signify a calm, or that there is no perceptible motion. (This *is the correct use*).
(*b*) Used to signify that the sky is clear, instead of inserting it in the proper column.
(*c*) Used to signify that no observation was taken.
(*d*) Used to signify that the direction in which the upper current was moving could not be determined on account of the sky being either perfectly clear or entirely overcast.

The first (*a*) is the correct use.

7. *Want of full and proper records of the direction of the wind*, some observers recording the direction only after each change, and then omitting it so long as it continues the same, merely inserting a figure to denote the force. It is better to make the record in full. Other observers record the direction *towards* which the wind or clouds are moving instead of indicating that *from* which they come. A WIND *from* the north, or CLOUDS moving *from* the north, are to be denoted by N, and *from* the south by S, &c.

8. *Different kinds of thermometers or different exposures used for the dry and wet-bulb thermometers*, so that the observations are not comparable readily, if at all.

9. *Diversity in the use of the dash and the sign* (") as follows:

(*a*) To signify that the entry next above is to be repeated.
(*b*) To signify that the entry next to the left is to be repeated.
(*c*) To signify that the entry next preceding in the order of time is to be repeated.
(*d*) To signify nothing at all, but merely to fill a blank.

The use of these characters has caused much trouble in the reduction, and the true remedy would be to *avoid them altogether*, by making each record complete in itself.

10. *Illegibility of the records*, either from defective chirography or from being entered in pencil marks and partly erased.

INSTRUCTIONS IN THE USE OF THE TABLES.

The first table will enable any one to obtain at sight the dew-point and relative humidity when the air and wet-bulb temperatures are given.

Example: Given $t=60°$; $t'=51°$; $t-t'=9°$, with $t=60°$ and $t-t'=9°$, we find from the table A, dew-point=43° and relative humidity 53 per cent. If it be desired at a high station, with a pressure of, say, 24″, to correct the above values, it may be done as follows: The vapor tension corresponding to 43° dew-point is found from the second column to be .277″ and the correction to this by table B at 24″ is +.018″, hence the *v. t.* corrected for elevation is .295″; the dew-point corresponding to this *v. t.* is 44.5°; with this dew-point and air temperature 60° we find the relative humidity 56.5 per cent. At temperatures below 20° the nearest even tenth should be taken for $t-t'$ and between 20° and 80° the nearest .5° should be used.

ABSOLUTE HUMIDITY.

If any one desires to determine the absolute humidity in grains per cubic foot he can do so by using Table C. Enter the table with the dew-point, and the absolute humidity may be taken right out; for example, a dew-point of 43° shows 3.178 grains of moisture in each cubic foot, at the temperature of $t=60$ and $t'=51°$. It will be readily seen that when we have the dew-point given we virtually have also the vapor tension and absolute humidity; *i. e.*, at any station the form of the curve of the above three elements will be absolutely the same. When we have lines of equal dew-point on a map of any region we have also those of equal vapor tension, and absolute humidity, or, in other words, a line of equal dew-points marked as 49° may be marked as equivalent to a vapor tension of .347″ and an absolute humidity of 3.937 grains.

CORRECTION OF BAROMETER READING TO 32°.

Table D.—Enter the table with the observed pressure and the temperature of the attached thermometer. For example, suppose we have given pressure 28″.5 and attached thermometer 73°, the correction would be —.113″; that is, .113″ must be subtracted from the reading of the barometer to reduce it to freezing.

REDUCTION OF BAROMETER READINGS TO SEA-LEVEL.

Table E is to be used for this reduction. The following example will show its use: Suppose the height of the station is 670 feet, and the temperature of the outside air obtained from the dry-bulb thermometer at the time of the observation is 45°, then the reduction would be .737″ or .74″; this amount is to be added to the observed barometer reading to reduce it to sea-level. In using the table observers should construct one in manuscript, after learning the height of the station; this should be carried out to every degree or every two degrees of air temperature for the height of the station as found in the left-hand column.

TABLE A.—*Dew-point and relative humidity.*

TABLE A.—*Dew-point and relative humidity*—Continued.

Depression of the wet bulb thermometer ($t-t'$).

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TABLE A.—*Dew-point and relative humidity*—Continued.

TABLE A.—*Dew-point and relative humidity*—Continued.

Depression of the wet bulb. ($t - t'$).

TABLE A.—*Dew-point and relative humidity*—Continued.

TABLE A.—*Dew-point and relative humidity*—Continued.

Depression of the wet-bulb thermometer ($t - t'$).

TABLE A.—*Dew-point and relative humidity*—Continued.

Air temperature.	Depression of the wet-bulb thermometer ($t - t'$)																									
	Dew-point.	Rel. humidity.	Dew-point.	Rel. humidity.	Dew-point.	Rel. humidity.	Dew-point.	Rel. humidity.	Dew-point.	Rel. humidity.	Dew-point.	Rel. humidity.	Dew-point.	Rel. humidity.	Dew-point.	Rel. humidity.	Dew-point.	Rel. humidity.	Dew-point.	Rel. humidity.	Dew-point.	Rel. humidity.	Dew-point.	Rel. humidity.	Dew-point.	Rel. humidity.
	36.0		37.0		38.0		39.0		40.0		41.0		42.0		43.0		44.0		45.0		46.0		47.0		48.0	
90	-20	1																								
91	-7	2	-46																							
92	1	3	-16	1																						
93	8	4	-4	2	-30	1																				
94	13	5	4	3	-11	2																				
95	18	6	10	4	-1	3	-22	1																		
96	22	7	15	5	6	3	-7	2	-63																	
97	25	8	19	6	12	4	1	3	-16	1																
98	28	9	23	7	17	5	8	4	-4	2	-30															
99	31	9	27	8	21	6	14	5	4	3	-11	1														
100	34	10	30	9	25	7	19	5	11	4	0	2														
101	37	11	32	9	28	8	23	6	16	5	7	3														
102	39	12	35	10	31	9	26	7	20	5	13	4														
103	41	12	38	11	34	9	29	8	24	6	18	5	10	3	-2	2	-28									
104	44	13	40	12	37	10	32	8	28	7	22	6	15	4	6	3	-9	1								
105	46	14	43	12	37	11	35	9	31	8	26	6	20	5	12	4	1	2	-20	1						
106	48	14	45	13	42	11	38	10	34	8	29	7	24	6	17	4	9	3	-4	2	-46					
107	50	15	47	14	44	12	40	11	37	9	32	8	28	6	22	5	15	4	4	3	-12	1				
108	52	16	49	14	46	13	43	11	39	10	35	9	31	7	26	6	19	4	11	3	0	2	-23			
109	54	16	51	15	48	13	45	12	42	10	38	9	34	8	30	6	24	5	17	4	8	3	-6	1	-74	
110	55	17	53	15	50	14	47	13	44	11	41	10	37	8	33	7	28	6	21	5	14	4	4	2	-15	1
111	57	18	55	16	52	15	49	13	46	12	43	10	39	9	35	8	31	7	25	5	19	4	11	3	-1	1
112	59	18	56	17	54	15	51	14	48	12	45	11	42	10	38	8	34	7	29	6	24	5	16	4	7	2
113	60	19	58	17	56	16	53	14	50	13	47	12	44	10	41	9	37	8	32	7	28	6	21	4	14	3
114	62	19	60	18	58	16	55	15	52	14	50	12	47	11	43	10	40	8	35	7	31	6	26	5	19	4
115	64	20	62	18	59	17	57	16	54	14	52	13	49	12	46	10	42	9	38	8	34	7	30	5	24	4
116	65	20	63	19	61	17	59	16	56	15	54	13	51	12	48	11	45	10	41	8	37	7	33	6	28	5
117	67	21	65	19	63	18	60	17	58	15	56	14	53	13	50	11	47	10	44	9	40	8	36	7	31	6
118	68	21	66	20	64	18	62	17	60	16	57	15	55	13	52	12	49	11	46	10	43	8	39	7	34	6
119	70	22	68	20	66	19	64	18	61	16	59	15	57	14	54	12	51	11	48	10	45	9	42	8	37	7
120	71	22	69	21	67	19	65	18	63	17	61	16	59	14	56	13	53	12	50	11	47	10	44	9	40	8
121	73	23	71	21	69	20	67	18	65	17	63	16	60	15	58	13	55	12	52	11	50	10	47	9	43	8
122	74	23	72	22	70	20	68	19	66	18	64	17	62	15	60	14	57	13	54	12	52	11	49	10	46	9
123	75	24	74	22	72	21	70	19	68	18	66	17	64	16	61	14	59	13	56	12	54	11	51	10	48	9
124	77	24	75	23	73	21	71	20	69	19	67	18	65	16	63	15	61	14	58	13	56	12	53	11	50	9
125	78	24	76	23	75	22	73	20	71	19	69	18	67	17	65	15	63	14	60	13	58	12	55	11	53	10
126	80	25	78	23	76	22	74	21	73	20	71	19	69	17	67	16	64	15	62	14	60	13	57	12	54	10
127	81	25	79	24	78	23	76	21	74	20	72	19	70	18	68	16	66	15	64	14	62	13	59	12	56	11
128	82	26	81	24	79	23	77	22	75	21	74	19	72	18	70	17	68	16	65	15	63	14	61	13	58	11
129	84	26	82	25	80	24	79	22	77	21	75	20	73	19	71	17	69	16	67	15	65	14	63	13	60	12
130	85	27	83	25	82	24	80	23	78	21	76	20	75	19	73	18	71	17	69	16	67	15	64	14	62	13
131	86	27	85	26	83	24	81	23	80	22	78	21	76	19	74	18	72	17	70	16	68	15	66	14	64	13
132	87	27	86	26	84	25	83	23	81	22	79	21	78	20	76	19	74	18	72	16	70	15	68	14	66	13
133	89	28	87	26	86	25	84	24	82	23	81	21	79	20	77	19	75	18	73	17	71	16	69	15	67	14
134	90	28	88	27	87	25	85	24	84	23	82	22	80	21	79	19	77	18	75	17	73	16	71	15	69	14
135	91	28	90	27	88	26	87	24	85	23	83	22	82	21	80	20	78	19	76	18	75	17	73	16	71	15
136	92	29	91	27	89	26	88	25	86	24	85	22	83	21	81	20	80	19	78	18	76	17	74	16	72	15
137	94	29	92	28	91	26	89	25	88	24	86	23	84	22	83	20	81	19	79	18	78	17	76	16	74	15
138	95	29	93	28	92	27	90	25	89	24	87	23	86	22	84	21	82	20	81	19	79	18	77	17	75	16
139	96	30	95	28	93	27	92	26	90	25	89	24	87	22	85	21	84	20	82	19	80	18	79	17	77	16
140	97	30	96	29	94	28	93	26	91	25	90	24	88	23	87	22	85	21	83	20	82	18	80	17	78	16

TABLE B.—*Correction of vapor tension for elevation.*

t-t'	31"	30"	29"	28"	27"	26"	25"	24"	23"	22"	21"	20"	19"	18"
1	—.001	.000	.000	.001	.001	.001	.002	.002	.002	.003	.003	.004	.004	.004
2	—.001	.000	.000	.001	.002	.003	.003	.004	.005	.006	.006	.007	.008	.009
3	—.002	—.001	.000	.002	.003	.004	.005	.006	.007	.008	.009	.011	.012	.013
4	—.002	—.001	.001	.002	.004	.005	.007	.008	.010	.011	.013	.014	.016	.017
5	—.003	—.001	.001	.003	.004	.006	.008	.010	.012	.014	.016	.018	.020	.021
6	—.004	—.001	.001	.003	.005	.008	.010	.012	.014	.017	.019	.021	.024	.025
7	—.004	—.002	.001	.004	.006	.009	.012	.014	.017	.019	.022	.025	.027	.030
8	—.005	—.002	.001	.004	.007	.010	.013	.016	.019	.022	.025	.028	.031	.034
9	—.005	—.002	.001	.005	.008	.011	.015	.018	.022	.025	.028	.032	.035	.039
10	—.006	—.002	.001	.005	.009	.013	.017	.020	.024	.028	.032	.035	.039	.043
11	—.007	—.003	.002	.006	.010	.014	.018	.022	.026	.031	.035	.039	.043	.047
12	—.007	—.003	.002	.006	.011	.015	.020	.024	.029	.033	.038	.042	.047	.052
13	—.008	—.003	.002	.007	.012	.017	.021	.026	.031	.036	.041	.046	.051	.056
14	—.009	—.003	.002	.007	.013	.018	.023	.028	.034	.039	.044	.050	.055	.060
15	—.009	—.004	.002	.008	.013	.019	.025	.030	.036	.042	.047	.053	.059	.064
16	—.010	—.004	.002	.008	.014	.020	.026	.032	.038	.045	.051	.057	.063	.069
17	—.011	—.004	.002	.009	.015	.022	.028	.034	.041	.047	.054	.060	.067	.073
18	—.011	—.004	.003	.009	.016	.023	.030	.037	.043	.050	.057	.064	.071	.077
19	—.012	—.005	.003	.010	.017	.024	.031	.039	.046	.053	.060	.067	.074	.082
20	—.012	—.005	.003	.010	.018	.025	.033	.041	.048	.056	.063	.071	.078	.086
21	—.013	—.005	.003	.011	.019	.027	.035	.043	.051	.058	.066	.074	.082	.090
22	—.014	—.005	.003	.011	.020	.028	.036	.045	.053	.061	.070	.078	.086	.095
23	—.014	—.006	.003	.012	.021	.029	.038	.047	.055	.064	.073	.081	.000	.099
24	—.015	—.006	.003	.012	.021	.031	.040	.049	.058	.067	.076	.085	.094	.103
25	—.015	—.006	.003	.013	.022	.032	.041	.051	.060	.070	.079	.088	.098	.107
26	—.016	—.006	.004	.013	.023	.033	.043	.053	.063	.072	.082	.092	.102	.112
27	—.017	—.006	.004	.014	.024	.034	.045	.055	.065	.075	.085	.096	.106	.116
28	—.017	—.007	.004	.014	.025	.036	.046	.057	.067	.078	.089	.099	.110	.120
29	—.018	—.007	.004	.015	.026	.037	.048	.059	.070	.081	.092	.103	.114	.125
30	—.019	—.007	.004	.015	.027	.038	.050	.061	.072	.084	.095	.106	.118	.129
31	—.019	—.007	.004	.016	.028	.039	.051	.063	.075	.086	.098	.110	.121	.133
32	—.020	—.007	.004	.017	.029	.041	.053	.065	.077	.089	.101	.113	.125	.137
33	—.020	—.008	.005	.017	.030	.042	.054	.067	.079	.092	.104	.117	.129	.142
34	—.021	—.008	.005	.018	.030	.043	.056	.069	.082	.095	.107	.120	.133	.146
35	—.022	—.008	.005	.018	.031	.045	.058	.071	.084	.097	.111	.124	.137	.150
36	—.022	—.009	.005	.019	.032	.046	.059	.073	.087	.100	.114	.127	.141	.155
37	—.023	—.009	.005	.019	.033	.047	.061	.075	.089	.103	.117	.131	.145	.159
38	—.023	—.009	.005	.020	.034	.048	.063	.077	.091	.106	.120	.135	.149	.163
39	—.024	—.009	.005	.020	.035	.050	.064	.079	.094	.109	.123	.138	.153	.168
40	—.025	—.010	.006	.021	.036	.051	.066	.081	.096	.111	.126	.142	.157	.172

TABLE C.—*Dew-point and absolute humidity.*

[Grains per cubic foot.]

Dew-point.	0	1	2	3	4	5	6	7	8	9
—30	.131	.124	.117	.111	.105	.099	.094	.089	.084	.080
—20	.219	.208	.198	.188	.179	.170	.161	.153	.145	.138
—10	.356	.340	.324	.309	.294	.280	.267	.254	.242	.230
— 0	.565	.540	.516	.493	.471	.450	.430	.410	.391	.373
+ 0	.565	.591	.618	.646	.675	.705	.736	.767	.800	.835
10	.873	.911	.950	.991	1.033	1.077	1.122	1.169	1.218	1.268
20	1.320	1.374	1.431	1.489	1.549	1.611	1.676	1.743	1.812	1.883
30	1.957	2.034	2.113	2.195	2.280	2.367	2.457	2.550	2.646	2.746
40	2.849	2.955	3.065	3.178	3.295	3.415	3.539	3.668	3.801	3.937
50	4.077	4.223	4.373	4.527	4.686	4.850	5.018	5.192	5.371	5.526
60	5.746	5.942	6.143	6.350	6.564	6.784	7.010	7.243	7.482	7.728
70	7.981	8.241	8.509	8.784	9.067	9.358	9.657	9.964	10.279	10.603
80	10.936	11.278	11.628	11.988	12.358	12.737	13.127	13.529	13.941	14.362
90	14.794	15.238	15.693	16.160	16.637	17.128	17.631	18.146	18.674	19.216
100	19.771	20.340	20.922	21.518	22.129	22.756	23.397	24.053	24.725	25.413
110	26.118	26.839	27.576	28.330	29.102	29.894	30.706	31.528	32.374	33.238
120	34.124	35.026	35.951	36.895	37.860	38.847	39.855	40.884	41.937	40.013

TABLE D.—*Correction to be applied to barometers with brass scales, extending from the cistern to the top of the mercurial column, to reduce the observation to 32° Fahrenheit.*

Temperature.	Inches.														
	24.0.	24.5.	25.0.	25.5.	26.0.	26.5.	27.0	27.5	28.0	28.5	29.0	29.5	30.0	30.5	31.0
°	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
0	.061	.063	.064	.065	.067	.068	.069	.071	.072	.073	.074	.076	.077	.078	.080
1	.059	.061	.062	.063	.064	.065	.067	.068	.069	.071	.072	.073	.074	.076	.077
2	.057	.058	.060	.061	.062	.063	.064	.066	.067	.068	.069	.070	.072	.073	.074
3	.055	.056	.057	.059	.060	.061	.062	.063	.064	.065	.067	.068	.069	.070	.071
4	.053	.054	.055	.056	.057	.058	.059	.061	.062	.063	.064	.065	.066	.067	.068
5	.051	.052	.053	.054	.055	.056	.057	.058	.059	.060	.061	.062	.063	.065	.066
6	.049	.050	.051	.052	.053	.054	.055	.056	.057	.058	.059	.060	.061	.062	.063
7	.046	.047	.048	.049	.050	.051	.052	.053	.054	.055	.056	.057	.058	.059	.060
8	.044	.045	.046	.047	.048	.049	.050	.051	.052	.053	.054	.054	.055	.056	.057
9	.042	.043	.044	.045	.046	.046	.047	.048	.049	.050	.051	.052	.053	.054	.054
10	.040	.041	.042	.042	.043	.044	.045	.046	.047	.047	.048	.049	.050	.051	.052
11	.038	.039	.039	.040	.041	.042	.042	.043	.044	.045	.046	.046	.047	.048	.049
12	.036	.036	.037	.038	.039	.039	.040	.041	.042	.042	.043	.044	.045	.045	.046
13	.033	.034	.035	.036	.036	.037	.038	.038	.039	.040	.040	.041	.042	.043	.043
14	.031	.032	.033	.033	.034	.035	.035	.036	.037	.037	.038	.038	.039	.040	.040
15	.029	.030	.030	.031	.032	.032	.033	.033	.034	.035	.035	.036	.036	.037	.038
16	.027	.028	.029	.029	.029	.030	.030	.031	.032	.032	.033	.033	.034	.034	.035
17	.025	.025	.026	.026	.027	.027	.028	.028	.029	.030	.030	.031	.031	.032	.032
18	.023	.023	.024	.024	.025	.025	.025	.026	.026	.027	.027	.028	.028	.029	.029
19	.021	.021	.021	.022	.022	.023	.023	.024	.024	.024	.025	.025	.026	.026	.027
20	.018	.019	.019	.029	.020	.020	.021	.021	.021	.022	.022	.023	.023	.023	.024
21	.016	.017	.017	.017	.018	.018	.018	.019	.019	.019	.020	.020	.020	.021	.021
22	.014	.014	.015	.015	.015	016	.016	.016	.016	.017	.017	.017	.018	.018	.018
23	.012	.012	.012	.013	.013	.013	.013	.014	.014	.014	.014	.015	.015	.015	.015
24	.010	.010	.010	.010	.011	.011	.011	.011	.011	.012	.012	.012	.012	.012	.013
25	.008	.008	.008	.008	.008	.008	.009	.009	.009	.009	.009	.009	.009	.010	.010
26	.005	.006	.006	.006	.006	.006	.006	.006	.006	.006	.007	.007	.007	.007	.007
27	.003	.003	.003	.003	.004	.004	.004	.004	.504	.004	.004	.004	.004	.004	.004
28	.001	.001	.001	.001	.001	.001	.001	.001	.000	.001	.001	.001	.001	.001	.001
	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
29	.001	.001	.001	.001	.001	.001	.001	.001	.001	.001	.001	.001	.001	.001	.001
30	.003	.003	.003	.004	.004	.004	.004	.004	.004	.004	.004	.004	.004	.004	.004
31	.005	.006	.006	.006	.006	.006	.006	.006	.006	.007	.007	.007	.007	.007	.007
32	.008	.008	.008	.008	.008	.008	.009	.009	.009	.009	.009	.009	.009	.010	.010
33	.010	.010	.010	.010	.011	.011	.011	.011	.012	.012	.012	.012	.012	.012	.012
34	.012	.012	.012	.013	.013	.013	.014	.014	.014	.014	.015	.015	.015	.015	.015
35	.014	.014	.015	.015	.015	.015	.016	.016	.016	.017	.017	.017	.018	.018	.018
36	.016	.017	.017	.017	.017	.018	.018	.019	.019	.019	.020	.020	.020	.021	.021
37	.018	.019	.019	.019	.020	.020	.021	.021	.021	.022	.022	.022	.023	.023	.024
38	.020	.021	.021	.022	.022	.023	.023	.023	.024	.024	.025	.025	.026	.026	.026
39	.023	.023	.024	.024	.024	.025	.025	.026	.026	.027	.027	.028	.028	.029	.029
40	.025	.025	.026	.026	.027	.027	.028	.028	.029	.029	.030	.030	.031	.031	.032
41	.027	.027	.028	.029	.029	.030	.030	.031	.031	.032	.033	.033	.034	.034	.035
42	.029	.030	.030	.031	.031	.032	.033	.033	.034	.034	.035	.036	.036	.037	.037
43	.031	.032	.032	.033	.034	.034	.035	.036	.036	.037	.038	.038	.039	.040	.040
44	.033	.034	.035	.035	.036	.037	.037	.038	.039	.040	.040	.041	.042	.042	.043
45	.035	.036	.037	.038	.038	.039	.040	.041	.041	.042	.043	.044	.044	.045	.046
46	.038	.038	.039	.040	.041	.042	.042	.043	.044	.045	.045	.046	.047	.048	.049
47	.040	.041	.041	.042	.043	.044	.045	.046	.046	.047	.048	.049	.050	.051	.051
48	.042	.043	.044	.045	.045	.046	.047	.048	.049	.050	.051	.052	.052	.053	.054
49	.044	.045	.046	.047	.048	.049	.050	.050	.051	.052	.053	.054	.055	.056	.057
50	.046	.047	.048	.049	.050	.051	.052	.053	.054	.055	.056	.057	.058	.059	.060

TABLE D—Continued.

Temperature.	Inches.														
	24.0	24.5	25.0	25.5	26.0	26.5	27.0	27.5	28.0	28.5	29.0	29.5	30.0	30.5	31.0
°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
51	.048	.049	.050	.051	.052	.053	.054	.055	.056	.057	.058	.059	.060	.061	.062
52	.050	.052	.053	.054	.055	.056	.057	.058	.059	.060	.061	.062	.063	.064	.065
53	.053	.054	.055	.056	.057	.058	.059	.060	.061	.063	.064	.065	.066	.067	.068
54	.055	.056	.057	.058	.059	.060	.062	.063	.064	.065	.066	.067	.068	.070	.071
55	.057	.058	.059	.060	.062	.063	.064	.065	.066	.068	.069	.070	.072	.072	.073
56	.059	.060	.061	.063	.064	.065	.066	.068	.069	.070	.071	.073	.074	.075	.076
57	.061	.062	.064	.065	.066	.068	.069	.070	.071	.073	.074	.075	.076	.078	.079
58	.063	.065	.066	.067	.069	.070	.071	.073	.074	.075	.077	.078	.079	.081	.082
59	.065	.067	.068	.070	.071	.072	.074	.075	.076	.078	.079	.080	.082	.083	.085
60	.068	.069	.070	.072	.073	.075	.076	.077	.079	.080	.082	.083	.085	.086	.087
61	.070	.071	.073	.074	.075	.077	.078	.080	.081	.083	.084	.086	.087	.089	.090
62	.072	.073	.075	.076	.078	.079	.081	.082	.084	.085	.087	.088	.090	.091	.093
63	.074	.079	.077	.079	.080	.082	.083	.085	.086	.088	.089	.091	.093	.094	.096
64	.076	.078	.079	.081	.082	.084	.086	.087	.089	.090	.092	.094	.095	.097	.098
65	.078	.080	.082	.083	.085	.086	.088	.090	.091	.093	.095	.096	.098	.100	.101
66	.080	.082	.084	.085	.087	.089	.090	.092	.094	.096	.097	.099	.101	.102	.104
67	.083	.084	.086	.088	.089	.091	.093	.095	.096	.098	.100	.102	.103	.105	.107
68	.085	.086	.088	.090	.092	.094	.095	.097	.099	.101	.102	.104	.106	.108	.109
69	.087	.089	.090	.092	.094	.096	.098	.100	.101	.103	.105	.107	.109	.110	.112
70	.089	.091	.093	.095	.096	.098	.100	.102	.104	.106	.108	.109	.111	.113	.115
71	.091	.093	.095	.097	.099	.101	.102	.104	.106	.108	.110	.112	.114	.116	.118
72	.093	.095	.097	.099	.101	.103	.105	.107	.109	.111	.113	.115	.117	.119	.120
73	.095	.097	.099	.101	.103	.105	.107	.109	.111	.113	.115	.117	.119	.121	.123
74	.097	.099	.102	.104	.106	.108	.110	.112	.114	.116	.118	.120	.122	.124	.126
75	.100	.102	.104	.106	.108	.110	.112	.114	.116	.118	.120	.122	.125	.127	.129
76	.102	.104	.106	.108	.110	.112	.114	.117	.119	.121	.123	.125	.127	.129	.131
77	.104	.106	.108	.110	.112	.115	.117	.119	.121	.123	.126	.128	.130	.132	.134
78	.106	.108	.110	.113	.115	.117	.119	.122	.124	.126	.128	.130	.133	.135	.137
79	.108	.110	.113	.115	.117	.119	.122	.124	.126	.128	.131	.133	.135	.137	.140
80	.110	.113	.115	.117	.119	.122	.124	.126	.129	.131	.133	.136	.138	.140	.143
81	.112	.115	.117	.119	.122	.124	.126	.129	.131	.134	.136	.138	.141	.143	.145
82	.114	.117	.119	.122	.124	.126	.129	.131	.134	.136	.138	.141	.143	.146	.148
83	.117	.119	.121	.124	.126	.129	.131	.134	.136	.139	.141	.143	.146	.148	.151
84	.119	.121	.124	.126	.129	.131	.134	.136	.139	.141	.144	.146	.149	.151	.154
85	.121	.123	.126	.128	.131	.133	.136	.139	.141	.144	.146	.149	.151	.154	.156
86	.123	.126	.128	.131	.133	.136	.138	.141	.144	.146	.149	.151	.154	.156	.159
87	.125	.128	.130	.133	.136	.138	.141	.143	.146	.149	.151	.154	.157	.159	.162
88	.127	.130	.133	.135	.138	.141	.143	.146	.149	.151	.154	.157	.159	.162	.165
89	.129	.132	.135	.137	.140	.143	.146	.148	.151	.154	.156	.159	.162	.165	.167
90	.131	.134	.137	.140	.142	.145	.148	.151	.153	.156	.159	.162	.164	.167	.170
91	.134	.136	.139	.142	.145	.148	.150	.153	.156	.159	.162	.165	.167	.170	.173
92	.136	.139	.141	.144	.147	.150	.153	.156	.158	.161	.164	.167	.170	.172	.175
93	.138	.141	.144	.147	.149	.152	.155	.158	.161	.164	.167	.170	.172	.175	.178
94	.140	.143	.146	.149	.152	.155	.157	.161	.163	.166	.169	.172	.175	.177	.180
95	.142	.145	.148	.151	.154	.157	.160	.163	.166	.169	.172	.175	.178	.180	.183
96	.144	.147	.150	.153	.156	.159	.162	.165	.168	.171	.174	.178	.181	.183	.183
97	.146	.149	.152	.156	.159	.162	.165	.168	.171	.174	.177	.180	.183	.186	.189
98	.148	.152	.155	.158	.161	.164	.167	.170	.173	.176	.179	.183	.186	.188	.191
99	.151	.154	.157	.160	.163	.166	.169	.173	.176	.179	.182	.185	.188	.191	.194
100	.153	.156	.159	.162	.165	.169	.172	.175	.178	.181	.184	.188	.191	.194	.197

TABLE E.—*Table for reducing observations of the barometer to sea-level, correction additive.*

Height in feet.	Temperature of external air—degrees Fahrenheit.												
	—20°	—10°	0°	10°	20°	30°	40°	50°	60°	70°	80°	90°	100°
10	.013	.013	.012	.012	.012	.012	.011	.011	.011	.011	.010	.010	.010
20	.026	.025	.025	.024	.023	.023	.023	.022	.022	.021	.021	.020	.020
30	.039	.038	.037	.036	.035	.034	.034	.033	.032	.032	.031	.030	.030
40	.052	.050	.049	.048	.047	.046	.045	.044	.043	.042	.041	.040	.040
50	.065	.063	.061	.060	.059	.058	.056	.055	.054	.053	.052	.051	.050
60	.077	.076	.074	.072	.070	.069	.068	.066	.065	.063	.062	.061	.059
70	.090	.088	.086	.084	.082	.081	.078	.077	.076	.074	.072	.071	.069
80	.103	.101	.098	.096	.094	.092	.090	.088	.086	.084	.082	.081	.079
90	.116	.113	.111	.108	.105	.104	.101	.099	.097	.095	.093	.091	.089
100	.129	.126	.123	.120	.117	.115	.112	.110	.108	.105	.103	.101	.099
110	.142	.139	.135	.132	.129	.126	.123	.121	.119	.116	.113	.111	.109
120	.155	.151	.148	.144	.140	.138	.134	.132	.129	.126	.124	.121	.119
130	.168	.164	.160	.156	.152	.149	.146	.143	.140	.137	.134	.131	.129
140	.181	.176	.172	.168	.164	.161	.157	.154	.151	.147	.144	.141	.139
150	.194	.189	.185	.180	.176	.172	.168	.165	.162	.158	.155	.152	.149
160	.206	.201	.197	.192	.187	.183	.179	.176	.172	.168	.165	.162	.158
170	.219	.214	.209	.201	.199	.195	.190	.187	.183	.179	.175	.172	.168
180	.232	.227	.222	.216	.211	.206	.202	.198	.194	.189	.185	.182	.178
190	.245	.239	.234	.228	.222	.218	.213	.209	.204	.200	.196	.192	.188
200	.258	.252	.246	.210	.234	.229	.224	.220	.215	.210	.206	.202	.198
210	.271	.264	.258	.252	.246	.240	.235	.231	.226	.221	.216	.212	.208
220	.284	.277	.270	.264	.257	.252	.246	.242	.236	.231	.227	.222	.218
230	.296	.289	.283	.276	.269	.263	.257	.253	.247	.242	.237	.232	.228
240	.309	.302	.295	.288	.281	.275	.269	.264	.258	.252	.248	.242	.238
250	.322	.314	.307	.300	.293	.286	.280	.275	.269	.263	.258	.253	.248
260	.335	.327	.319	.311	.304	.297	.291	.285	.279	.273	.268	.263	.257
270	.348	.339	.331	.323	.316	.309	.302	.296	.290	.284	.278	.273	.267
280	.360	.352	.344	.335	.328	.320	.314	.307	.301	.294	.288	.283	.277
290	.373	.364	.356	.347	.339	.332	.325	.318	.311	.305	.299	.293	.287
300	.386	.377	.368	.359	.351	.343	.336	.329	.322	.315	.309	.303	.297
310	.399	.389	.380	.371	.363	.354	.347	.340	.333	.326	.319	.313	.307
320	.412	.402	.392	.383	.374	.366	.358	.351	.343	.336	.329	.323	.317
330	.424	.414	.404	.395	.386	.377	.369	.362	.354	.347	.340	.333	.326
340	.437	.427	.416	.407	.397	.389	.380	.373	.365	.357	.350	.343	.336
350	.450	.439	.429	.419	.409	.400	.392	.384	.376	.368	.360	.353	.346
360	.463	.451	.441	.430	.421	.411	.403	.394	.386	.378	.370	.363	.356
370	.476	.464	.453	.442	.432	.423	.414	.405	.397	.389	.380	.373	.366
380	.488	.476	.465	.454	.444	.434	.425	.416	.408	.399	.391	.383	.375
390	.501	.489	.477	.466	.455	.446	.436	.427	.418	.410	.401	.393	.385
400	.514	.501	.489	.478	.467	.457	.447	.438	.429	.420	.411	.403	.395
410	.527	.513	.501	.490	.479	.468	.458	.449	.440	.430	.421	.413	.405
420	.539	.526	.513	.502	.490	.480	.469	.460	.450	.441	.431	.423	.415
430	.552	.538	.525	.513	.502	.491	.480	.470	.461	.451	.442	.433	.425
440	.565	.551	.537	.525	.513	.502	.491	.481	.471	.462	.452	.443	.434
450	.578	.563	.550	.537	.525	.513	.503	.492	.482	.472	.462	.453	.444
460	.590	.575	.562	.549	.537	.525	.514	.503	.493	.482	.472	.463	.454
470	.603	.588	.574	.561	.548	.536	.525	.514	.508	.493	.482	.473	.464
480	.616	.600	.586	.572	.560	.547	.536	.524	.514	.503	.493	.468	.474
490	.628	.613	.598	.584	.571	.559	.547	.535	.524	.514	.503	.493	.483
500	.641	.625	.610	.596	.583	.570	.558	.546	.535	.524	.513	.503	.493
510	.654	.637	.622	.608	.594	.581	.560	.557	.545	.534	.523	.513	.503
520	.666	.650	.634	.620	.606	.593	.580	.568	.556	.545	.533	.523	.513
530	.679	.662	.646	.631	.617	.604	.591	.578	.566	.555	.544	.533	.522
540	.691	.675	.658	.643	.629	.615	.602	.589	.577	.565	.554	.543	.532
550	.701	.687	.670	.655	.640	.626	.613	.600	.587	.575	.564	.553	.542
560	.717	.699	.683	.667	.652	.638	.624	.611	.598	.586	.574	.563	.552
570	.729	.712	.695	.579	.663	.649	.635	.622	.608	.596	.584	.573	.562
580	.742	.724	.707	.690	.675	.660	.646	.632	.619	.606	.595	.583	.571
590	.754	.737	.719	.702	.686	.672	.657	.643	.629	.617	.605	.593	.581
600	.767	.749	.731	.714	.698	.683	.668	.654	.640	.627	.615	.603	.591
610	.780	.761	.743	.726	.709	.694	.679	.665	.650	.637	.625	.613	.601
620	.792	.774	.755	.738	.721	.705	.690	.675	.661	.648	.635	.623	.611
630	.805	.786	.767	.749	.732	.717	.701	.686	.671	.658	.645	.633	.620
640	.817	.798	.779	.761	.744	.728	.712	.697	.682	.668	.655	.643	.630
650	.830	.811	.791	.773	.755	.739	.723	.708	.692	.679	.666	.653	.640
660	.843	.823	.803	.785	.767	.750	.734	.718	.703	.689	.676	.662	.650
670	.855	.835	.815	.797	.778	.761	.745	.729	.713	.699	.686	.672	.660
680	.868	.847	.827	.808	.790	.773	.756	.740	.724	.709	.696	.682	.669
690	.880	.860	.839	.820	.801	.784	.767	.750	.734	.720	.706	.692	.679

TABLE E—Continued.

Height in feet.	Temperature of external air—degrees Fahrenheit.												
	—20°	—10°	0°	10°	20°	30°	40°	50°	60°	70°	80°	90°	100°
700	.893	.872	.851	.832	.813	.795	.778	.761	.745	.730	.716	.702	.689
710	.905	.884	.863	.844	.824	.806	.789	.772	.755	.740	.726	.712	.698
720	.918	.896	.875	.855	.836	.817	.800	.782	.766	.751	.736	.722	.708
730	.930	.909	.887	.867	.847	.829	.811	.793	.776	.761	.746	.732	.718
740	.943	.921	.899	.879	.859	.840	.822	.804	.787	.771	.756	.742	.728
750	.955	.933	.911	.891	.870	.851	.833	.815	.797	.782	.767	.752	.738
760	.968	.945	.922	.902	.881	.862	.843	.825	.808	.792	.777	.761	.747
770	.980	.957	.934	.914	.893	.873	.854	.836	.818	.802	.787	.771	.757
780	.993	.970	.946	.926	.904	.885	.865	.847	.829	.812	.797	.781	.767
790	1.005	.982	.958	.937	.916	.896	.876	.857	.839	.823	.807	.791	.776
800	1.018	.994	.970	.949	.927	.907	.887	.868	.850	.833	.817	.801	.786
810	1.030	1.006	.982	.961	.938	.918	.898	.878	.860	.843	.827	.811	.796
820	1.043	1.018	.994	.972	.950	.929	.909	.889	.871	.854	.837	.821	.805
830	1.055	1.031	1.006	.984	.961	.940	.920	.900	.881	.864	.847	.831	.815
840	1.068	1.043	1.018	.995	.973	.951	.931	.911	.892	.874	.857	.841	.825
850	1.080	1.055	1.030	1.007	.984	.962	.942	.922	.902	.885	.867	.851	.835
860	1.093	1.067	1.041	1.019	.995	.974	.952	.932	.913	.895	.877	.860	.844
870	1.105	1.079	1.053	1.030	1.007	.985	.963	.943	.923	.905	.887	.870	.854
880	1.118	1.092	1.065	1.042	1.018	.996	.974	.954	.934	.915	.897	.880	.864
890	1.130	1.104	1.077	1.053	1.030	1.007	.985	.964	.944	.926	.907	.890	.873
900	1.143	1.116	1.089	1.065	1.041	1.018	.996	.975	.955	.936	.917	.900	.883
910	1.155	1.128	1.101	1.077	1.052	1.029	.007	.986	.965	.946	.927	.910	.893
920	1.168	1.140	1.113	1.088	1.064	1.040	1.018	.996	.976	.956	.937	.920	.902
930	1.180	1.152	1.125	1.100	1.075	1.051	1.029	1.007	.986	.967	.947	.929	.912
940	1.193	1.164	1.137	1.111	1.086	1.062	1.040	1.017	.997	.977	.957	.939	.921
950	1.205	1.177	1.149	1.123	1.098	1.074	1.051	1.028	1.007	.987	.967	.949	.931
960	1.217	1.189	1.160	1.135	1.109	1.085	1.061	1.039	1.017	.997	.977	.959	.841
970	1.230	1.201	1.172	1.146	1.120	1.096	1.072	1.049	1.028	1.007	.987	.969	.950
980	1.242	1.213	1.184	1.158	1.131	1.107	1.083	1.060	1.038	1.018	.997	.978	.960
990	1.255	1.225	1.196	1.169	1.143	1.118	1.094	1.070	1.049	1.028	1.007	.988	.969
1,000	1.267	1.237	1.208	1.181	1.154	1.129	1.105	1.081	1.059	1.038	1.017	.998	.979
1,010	1.279	1.249	1.220	1.192	1.165	1.140	1.116	1.092	1.069	1.048	1.027	1.008	0.989
1,020	1.292	1.261	1.232	1.204	1.177	1.151	1.127	1.102	1.080	1.058	1.037	1.018	0.998
1,030	1.304	1.273	1.243	1.215	1.188	1.162	1.137	1.113	1.090	1.069	1.047	1.027	1.008
1,040	1.317	1.285	1.255	1.227	1.199	1.173	1.148	1.123	1.101	1.079	1.057	1.037	1.017
1,050	1.329	1.298	1.267	1.238	1.211	1.184	1.159	1.134	1.111	1.089	1.067	1.047	1.027
1,060	1.341	1.310	1.279	1.250	1.222	1.195	1.170	1.145	1.121	1.099	1.077	1.057	1.037
1,070	1.354	1.322	1.291	1.261	1.233	1.206	1.181	1.155	1.132	1.109	1.087	1.067	1.046
1,080	1.366	1.334	1.302	1.273	1.244	1.217	1.191	1.166	1.142	1.120	1.097	1.076	1.056
1,090	1.379	1.346	1.314	1.284	1.256	1.228	1.202	1.176	1.153	1.130	1.107	1.086	1.065
1,100	1.391	1.358	1.326	1.296	1.267	1.239	1.213	1.187	1.163	1.140	1.117	1.096	1.075
1,110	1.403	1.370	1.338	1.307	1.278	1.250	1.224	1.198	1.173	1.150	1.127	1.196	1.085
1,120	1.416	1.382	1.350	1.319	1.289	1.261	1.235	1.208	1.184	1.160	1.137	1.115	1.094
1,130	1.428	1.394	1.361	1.330	1.301	1.272	1.245	1.219	1.194	1.170	1.147	1.125	1.104
1,140	1.440	1.406	1.373	1.342	1.312	1.283	1.256	1.229	1.204	1.180	1.157	1.135	1.113
1,150	1.453	1.418	1.385	1.353	1.323	1.294	1.267	1.240	1.215	1.191	1.167	1.145	1.123
1,160	1.465	1.430	1.397	1.365	1.334	1.305	1.278	1.251	1.225	1.201	1.177	1.154	1.133
1,170	1.477	1.442	1.409	1.376	1.345	1.315	1.289	1.261	1.235	1.211	1.187	1.164	1.142
1,180	1.489	1.454	1.420	1.388	1.357	1.327	1.299	1.272	1.245	1.221	1.197	1.174	1.152
1,190	1.502	1.466	1.432	1.399	1.368	1.338	1.310	1.282	1.256	1.231	1.207	1.183	1.161
1,200	1.514	1.478	1.444	1.411	1.379	1.349	1.321	1.293	1.266	1.241	1.217	1.193	1.171
1,210	1.526	1.490	1.456	1.422	1.390	1.360	1.332	1.303	1.276	1.251	1.227	1.203	1.180
1,220	1.539	1.502	1.467	1.434	1.401	1.371	1.342	1.314	1.288	1.261	1.237	1.212	1.190
1,230	1.551	1.514	1.479	1.445	1.413	1.382	1.353	1.324	1.297	1.271	1.247	1.222	1.199
1,240	1.463	1.526	1.491	1.457	1.424	1.393	1.364	1.335	1.307	1.281	1.257	1.232	1.209
1,250	1.576	1.538	1.502	1.468	1.435	1.404	1.374	1.345	1.317	1.291	1.266	1.242	1.218
1,260	1.588	1.550	1.514	1.479	1.446	1.415	1.385	1.356	1.328	1.302	1.276	1.251	1.228
1,270	1.600	1.562	1.526	1.491	1.457	1.426	1.396	1.366	1.338	1.312	1.286	1.261	1.237
1,280	1.612	1.574	1.538	1.502	1.469	1.437	1.407	1.377	1.348	1.322	1.296	1.271	1.247
1,290	1.625	1.586	1.549	1.514	1.480	1.448	1.417	1.387	1.359	1.332	1.306	1.280	1.256
1,300	1.637	1.598	1.561	1.525	1.491	1.459	1.428	1.398	1.369	1.342	1.316	1.290	1.266
1,310	1.649	1.610	1.573	1.536	1.502	1.470	1.439	1.408	1.379	1.352	1.326	1.300	1.275
1,320	1.661	1.622	1.584	1.548	1.513	1.481	1.449	1.419	1.390	1.362	1.336	1.309	1.285
1,330	1.674	1.634	1.596	1.559	1.525	1.492	1.460	1.429	1.400	1.372	1.346	1.319	1.294
1,340	1.686	1.646	1.608	1.571	1.536	1.503	1.471	1.440	1.410	1.382	1.356	1.329	1.304

TABLE E—Continued.

Height in feet.	Temperature of external air—degrees Fahrenheit.												
	—20°	—10°	0°	10°	20°	30°	40°	50°	60°	70°	80°	90°	100°
1,350	1.698	1.658	1.620	1.582	1.547	1.514	1.482	1.450	1.420	1.393	1.366	1.339	1.313
1,360	1.710	1.669	1.631	1.593	1.558	1.524	1.492	1.461	1.431	1.403	1.375	1.348	1.323
1,370	1.722	1.681	1.643	1.605	1.569	1.535	1.503	1.471	1.441	1.413	1.385	1.358	1.332
1,380	1.735	1.693	1.655	1.616	1.581	1.546	1.514	1.482	1.451	1.423	1.395	1.368	1.342
1,390	1.747	1.705	1.666	1.628	1.592	1.557	1.524	1.492	1.462	1.433	1.405	1.377	1.351
1,400	1.759	1.717	1.678	1.639	1.603	1.568	1.535	1.503	1.472	1.443	1.415	1.387	1.361
1,410	1.771	1.729	1.690	1.650	1.614	1.579	1.546	1.513	1.482	1.453	1.425	.397	1.370
1,420	1.783	1.741	1.701	1.662	1.625	1.590	1.556	1.524	1.492	1.463	1.435	.406	1.380
1,430	1.796	1.753	1.713	1.673	1.626	1.601	1.567	1.534	1.503	1.473	1.444	1.416	1.389
1,440	1.808	1.765	1.724	1.685	1.647	1.612	1.577	1.545	1.513	1.483	1.454	1.426	1.399
1,450	1.820	1.777	1.736	1.696	1.658	1.623	1.588	1.555	1.523	1.493	1.464	1.436	1.408
1,460	1.832	1.788	1.748	1.707	1.670	1.633	1 599	1.565	1.533	1.503	1.474	1.445	1.418
1,470	1.844	1.800	1.759	1.719	1.681	1.644	1.609	1.576	1.543	1.513	1.484	1.455	1.427
1,480	1.857	1.812	1.771	1.730	1.692	1.655	1.620	1.586	1.554	1.523	1.493	1.465	1.437
1,490	1.869	1.824	1.782	1.742	1.703	1.666	1.630	1.597	1.564	1.533	1.503	1.474	1.446
1,500	1.881	1.836	1.794	1.753	1.714	1.677	1.641	1.607	1.574	1.543	1.513	1.484	1.456

APPENDIX 27.

CLASSIFIED LIST OF STATIONS OF THE SIGNAL SERVICE.

STATIONS OF THE FIRST ORDER,

Making continuous records by means of self-registering instruments.

Washington City.¶

STATIONS OF THE SECOND ORDER,

Taking six observations daily, reporting three times a day by telegraph, and monthly by mail.

Boston, Mass.†*¶
Chicago, Ill.†*¶
New York City.†*¶
Philadelphia, Pa.¶
Prescott, Ariz.
Saint Louis, Mo.‡¶
San Francisco, Cal.†§*

Taking five observations daily, reporting three times a day by telegraph, and monthly by mail

Abilene, Tex.¶
Albany, N. Y.¶
Alpena, Mich.†*
Atlanta, Ga.‖¶
Atlantic City, N. J.†*
Augusta, Ga.†‡‖¶
Baltimore, Md.†*¶
Block Island, R. I.†*
Bridger, Fort, Wyo.
Buffalo, N. Y.†*¶
Cairo, Ill.‡¶
Canby, Fort, Wash.†*
Cape Henry, Va.*
Cape Mendocino, Cal.
Cedar Keys, Fla.†*‖
Charleston, S. C.†*‖¶
Charlotte, N. C.‖¶
Chattanooga, Tenn.‡¶‖
Cheyenne, Wyo.¶
Chincoteague, Va.†*
Cincinnati, Ohio.‡¶
Cleveland, Ohio.†*¶
Columbus, Ohio.¶
Concordia, Kans.¶
Davenport, Iowa.‡¶
Denver, Colo.¶
Des Moines, Iowa.¶
Detroit, Mich.†*¶
Dodge City, Kans.¶
Eastport, Me.†*
El Paso, Tex.
Erie, Pa.*¶
Escanaba, Mich.†*
Fort Smith, Ark.‡‖¶
Galveston, Tex.†*‖¶
Grand Haven, Mich.†*¶
Hatteras, N. C.*
Huron, Dak.
Indianapolis, Ind.¶
Indianola, Tex.*†
Jacksonville, Fla.†*¶
Keokuk, Iowa.‡¶
Key West, Fla.†*
Kitty Hawk, N. C.*
Knoxville, Tenn.‡¶
La Crosse, Wis.‡¶
Lamar, Mo.¶
Leavenworth, Kans.‡¶
Little Rock, Ark.‡‖¶
Los Angeles, Cal.
Louisville, Ky.‡¶
Lynchburg, Va.¶
Mackinaw City, Mich.†*
Macon, Fort. N. C.*
Marquette, Mich.†*
Memphis, Tenn.‡‖¶
Milwaukee, Wis.†*¶
Mobile, Ala.†*‖¶
Montgomery, Ala.‖¶
Moorhead, Minn.

* Displays cautionary signals.
† Takes observations of temperature of the water in river or harbor at 2 p. m. (75th meridian time), daily.
‡ Takes observations of the stage of water in the river at 2 p. m. (75th meridian time), daily.
§ Prints Farmers' Bulletin.
‖ Takes cotton-region observation at 6 p. m. (75th meridian time), daily.
¶ Displays cold-wave signal.

STATIONS OF THE SECOND ORDER—continued.

Mount Washington, N. H.
Myer, Fort, Va.
Nashville, Tenn.‡||¶
New London, Conn.†*¶
New Orleans, La.‡*||¶
Norfolk, Va.†*¶
North Platte, Nebr.¶
Olympia, Wash.*
Omaha, Nebr.‡¶
Oswego, N. Y.*¶
Palestine, Tex.||¶
Pensacola, Fla.†*
Pittsburg, Pa.‡¶
Port Huron, Mich.*
Portland, Me.†*¶
Portland, Oreg.‡†
Red Bluff, Cal.‡
Rio Grande City, Tex.
Rochester, N. Y.¶
Roseburg, Oreg.
Sacramento, Cal.‡
Saint Paul, Minn.‡¶
Saint Vincent, Minn.
Salt Lake City, Utah.
San Diego, Cal.*
Sandusky, Ohio.†*¶
Sandy Hook, N. J.†*
San Luis Obispo, Cal.
Santa Fé, N. Mex.
Savannah, Ga.†*||¶
Shreveport, La.‡||¶
Smithville, N. C.†*
Springfield, Ill.¶
Toledo, Ohio.†*¶
Valentine, Nebr.
Vicksburg, Miss.‡||¶
West Las Animas, Colo.
Winnemucca, Nev.
Yankton Dak.‡¶
Yuma, Ariz.‡

Taking five observations daily, making report once a day by telegraph, and monthly by mail.

Dubuque, Iowa.‡¶

Taking five observations daily, and reporting monthly by mail.

Boisé City, Idaho.
Frisco, Utah.
Greencastle, Ind.¶
Keeler, Cal.
New Haven, Conn.†¶
Pike's Peak, Colo.
Sanford, Fla.¶
Walla Walla, Wash.
Wilmington, N. C.†*||¶

Taking three observations daily, reporting three times a day by telegraph, and monthly by mail.

Apache, Fort, Ariz.
Assinaboine, Fort, Mont.
Bismarck, Dak.
Brownsville, Tex.
Buford, Fort, Dak.
Custer, Fort. Mont.
Deadwood, Dak.
Duluth, Minn.*†
Elliott, Fort, Tex.
Helena, Mont.
Maginnis, Fort, Mont.
Montrose, Colo.
Nantucket, Nantucket Island, Mass.*
Poplar River, Mont.
Port Angeles, Wash.*
San Antonio, Tex.||
Shaw, Fort, Mont.
Still, Fort. Ind. T.
Spokane Falls, Wash.
Stanton, Fort, N. Mex.
Tatoosh Island, Wash.
Totten, Fort, Dak.

Taking three observations daily, and reporting monthly by mail.

Benton, Fort, Mont.
Bidwell, Fort, Cal.
Davis, Fort, Tex.
Grant, Fort. Ariz.
Mumtrekhlagamut, Koskokvim River, Alaska.
Sitka, Alaska.
Sully, Fort, Dak.
Thomas, Fort, Ariz.

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* Displays cautionary signals.

† Takes observations of temperature of water in the river or harbor at 2 p. m. (75th meridian time), daily.

‡ Takes observations of the stage of water in the river at 2 p. m. (75th meridian time), daily.

|| Takes cotton-region observations at 6 p. m. (75th meridian time), daily.

¶ Displays cold-wave signal.

STATIONS OF THE THIRD ORDER,

Taking one observation daily (at the hour of sunset), and reporting monthly by mail.

Ashland, Oreg.
Astoria, Oreg.*
Bowie, Fort, Ariz.
Cape Henlopen, Del.*
Cœur d'Alene, Fort, Idaho.
Cottage City, Mass.*
Durango, Colo.
Edgartown, Mass.*
Henrietta, Tex.
Klamath, Fort, Oreg.
Lakeview, Oreg.
Laramie, Fort, Wyo.
Lava, N. Mex.
Linkville, Oreg.
Marfa, Tex.
Maricopa, Ariz.
McDowell, Fort, Ariz.
Narragansett Pier, R. I.
Neah Bay, Wash.
New River Inlet, N. C.*
Ocean City, Md.
Phœnix, Ariz.
Pysht, Wash.
Reno, Fort, Ind. T.
San Carlos Agency, Ariz.
Spokane, Fort, Wash.
Supply, Fort, Ind. T.
Verde, Fort, Ariz.
Wash Woods, N. C.
Watrous, N. Mex.
Webster, Dak.
Willcox, Ariz.
Yates, Fort, Dak.

REPAIR STATIONS,

On the United States military telegraph lines, at which no observations are taken.

Ash Fork, Ariz.
Cantonment, Ind. T.
Carter, Wyo.
Custer Station, Mont.
Edinburg, Tex.
Galpin, Mont.
Glendive, Mont.
Lakota, Dak.
Parker's, Oreg.
Robinson, Fort, Nebr.
Santa Maria, Tex.

SPECIAL PRINTING STATIONS.

Logansport, Ind.¶

SPECIAL DISPLAY STATIONS.

Stations receiving orders direct from Washington City.

Monroe, Fort, Va.

Stations receiving orders from Washington City (designating section affected) through the observer in charge of the section center.

Mackinaw Section (Chicago, Illinois, center).

Charlevoix, Mich.
Cheboygan, Mich.
Frankfort, Mich.
Petoskey, Mich.

Grand Haven Section (Chicago, Illinois, center).

Ludington, Mich.
Manistee, Mich.
Montague, Mich.
Muskegon, Mich.
Pentwater, Mich.
Saint Joseph, Mich.
South Haven, Mich.

Milwaukee Section (Milwaukee, Wisconsin, center).

Kenosha, Wis.
Manitowoc, Wis.
Racine, Wis.
Sheboygan, Wis.

Green Bay Section (Milwaukee, Wisconsin, center).

Ahnapee, Wis.
Green Bay, Wis.
Kewaunee, Wis.
Menominee, Mich.
Sturgeon Bay, Wis.

Saginaw Bay Section (Detroit, Michigan, center).

Bay City, Mich.
East Tawas, Mich.
Sand Beach, Mich.

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* Displays cautionary signals. ¶ Displays cold-wave signals.

SPECIAL DISPLAY STATIONS—continued.

Erie Section (Erie, Pennsylvania, center).

Ashtabula, Ohio.
Dunkirk, N. Y.

Oswego Section (Oswego, New York, center).

Cape Vincent, N. Y.
North Fair Haven, N. Y.

Portland Section (Portland, Maine, center).

Bath, Me.
Boothbay, Me.
Rockland, Me.
Southwest Harbor, Me.

Boston Section (Boston, Massachusetts, center).

Gloucester, Mass.
Marblehead, Mass.
Newburyport, Mass.
Portsmouth, N. H.

Wood's Holl Section (Boston, Massachusetts, center)

Bass River Light, Mass.
Highland Light, Mass.
Hyannis, Mass.
New Bedford, Mass.
Provincetown, Mass.
Wood's Holl, Mass.

Newport Section (New London, Connecticut, center).

Bristol, R. I.
Fall River, Mass.
Newport, R. I.
Stonington; Conn.

Narragansett Section (Narragansett Pier, Rhode Island, center).

Point Judith, R. I.

New Jersey Coast Section (Atlantic City, New Jersey, center).

Barnegat City, N. J.

Savannah Section (Savannah, Georgia, center).

Brunswick, Ga.
Port Royal, S. C.
Tybee Island, Ga.

Jacksonville Section (Jacksonville, Florida, center).

Fernandina, Fla.
Fort George Island, Fla.
Saint Augustine, Fla.

The following-named stations repeat cautionary signal orders issued to the stations set opposite their respective names:

Cedar Tree Neck, Mass	Cottage City, Mass.
Charlotte, N. Y	Rochester, N. Y.
City Island, N. Y	New York City.
Corpus Christi, Tex	Indianola, Tex.
Morgan, Fort, Ala	Mobile, Ala.
New Haven Light, Conn	New Haven, Conn.
Chicago Water Crib	Chicago, Ill.
Sand Key Light, Fla	Key West, Fla.
Port Eads, La	New Orleans, La.
Sankaty Head Light, Mass	Nantucket, Mass.

Milwaukee, Wisconsin, notifies, by telegraph, the postmasters at Ashland, Wisconsin, and Houghton, Michigan, of all cautionary signal orders for Duluth, Minnesota, and Marquette, Michigan.

Cleveland, Ohio, notifies, by telegraph, Mr. E. D. Foskett, Lorain, Ohio, of all cautionary signal orders for Cleveland.

Indianola, Tex., notifies Brownsville, Tex., of all cautionary signal orders for Indianola.

Pensacola, Fla., notifies Apalachicola, Fla., of all cautionary signal orders for Pensacola.

SPECIAL RIVER STATIONS.

Observations of the stage of water in the river are taken at 2 p. m. (75th meridian time), daily.

Cairo, Illinois (center).

Evansville, Ind.
Grand Tower, Ill.
Johnsonville, Tenn.
Mount Carmel, Ill.
Paducah, Ky.
Vincennes, Ind.

SPECIAL RIVER STATIONS—continued.

Charleston, South Carolina (center).

Mount Holly, N. C.

Chattanooga, Tennessee (center).

Charleston, Tenn.
Clinton, Tenn.
Decatur, Ala.
Kingston, Tenn.
Leadvale, Tenn.
Loudon, Tenn.
Strawberry Plains, Tenn.

La Crosse, Wisconsin (center).

Wabasha, Minn.

Leavenworth, Kansas (center).

Plattsmouth, Nebr.
Saint Joseph, Mo.

Little Rock, Arkansas (center).

Dardanelle, Ark.

Nashville, Tennessee (center).

Burnside, Ky.
Carthage, Tenn.

New Orleans, Louisiana (center).

Alexandria, La.
Bayou Sara, La.
Camden, Ark.
Delhi, La.
Girard, La.
Monroe, La.
West Melville, La.

Pittsburg, Pennsylvania (center).

Brookville, Pa.
Clarion, Pa.
Confluence, Pa.
Freeport, Pa.
Johnstown, Pa.
Lock No. 4, Pa.
Mahoning, Pa.
Marietta, Ohio.
Morgantown, W. Va.
New Geneva, Pa.
Oil City, Pa.
Parker's Landing, Pa.
Rowlesburg, W. Va.
Saltsburg, Pa.
Warren, Pa.
Weston, W. Va.
Wheeling, W. Va.

Portland, Oregon (center).

Albany, Oreg.
Eugene City, Oreg.
Umatilla, Oreg.

Sacramento, California (center).

Colusa, Cal.
Folsom City, Cal.
Marysville, Cal.
Oroville, Cal.

Saint Louis, Missouri (center).

Beardstown, Ill.
Boonville, Mo.
Hermann, Mo.
Jerome, Mo.
Kansas City, Mo.
Lexington, Mo.
Louisiana, Mo.
Peoria, Ill.
Warsaw, Ill.

Shreveport, Louisiana (center).

Coushatta Chute, La.
Fulton, Ark.

Vicksburg, Mississippi (center).

Arkansas City, Ark.
Newport, Ark.
Yazoo City, Miss.

Washington City (center).

Harper's Ferry, W. Va.
Helena, Ark.
Le Claire, Iowa.
Muscatine, Iowa.

SPECIAL COTTON-REGION STATIONS AND CENTERS.

One observation made daily at 6 p. m. (75th meridian time).

Wilmington, North Carolina (center).

Cheraw, S. C.
Florence, S. C.
Goldsborough, N. C.
Lumberton, N. C.
New Berne, N. C.
Raleigh, N. C.
Salisbury, N. C.
Wadesborough, N. C.
Weldon, N. C.

Charleston, South Carolina (center).

Branchville, S. C.
Hardeeville, S. C.
Jacksonborough, S. C.
Kingstree, S. C.
Saint George's, S. C.
Saint Matthew's, S. C.
Yemâsseé, S. C.

Augusta, Georgia (center).

Allendale, S. C.
Athens, Ga.
Batesburg, S. C.
Blackville, S. C.
Camak, Ga.
Chester, S. C.
Columbia, S. C.
Greenwood, S. C.
Union Point, Ga.
Washington, Ga.
Waynesborough, Ga.

Savannah, Georgia (center).

Albany, Ga.
Allapaha, Ga.
Bainbridge, Ga.
Eastman, Ga.
Fernandina, Fla.*a
Fort Gaines, Ga.
Jessup, Ga.
Live Oak, Fla.
Millen, Ga.
Quitman, Ga.
Smithville, Ga.
Thomasville, Ga.
Waldo, Fla.a
Way Cross, Ga.

Atlanta, Georgia (center).

Anderson, S. C.
Cartersville, Ga.
Columbus, Ga.
Gainesville, Ga.
Greenville, S. C.
Griffin, Ga.
Macon, Ga.
Newnan, Ga.
Spartanburg, S. C.
Toccoa, Ga.
West Point, Ga.

Montgomery, Alabama (center).

Birmingham, Ala.
Eufaula, Ala.
Fort Deposit, Ala.
Greenville, Ala.
Marion, Ala.
Calera, Ala.
Opelika, Ala.
Pine Apple, Ala.
Selma, Ala.

Mobile, Alabama (center).

Aberdeen, Miss.
Columbus, Miss.
Evergreen, Ala.
Livingston, Ala.
Macon, Miss.
Meridian, Miss.
Okolona, Miss.
Waynesborough, Miss.

New Orleans, Louisiana (center)

Alexandria, La.
Amite City, La.
Brookhaven, Miss.
Cheneyville, La.
Coushatta Chute, La.
Hazlehurst, Miss.
Lafayette, La.
Minden, La.
Natchez, Miss.
Natchitoches, La.
Opelousas, La.
Port Gibson, Miss.

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* Displays cautionary signals.
a These reports are consolidated at Cedar Keys and telegraphed to Savannah.

SPECIAL COTTON-REGION STATIONS AND CENTERS—continued.

Galveston, Texas (center).

Austin, Tex.	Huntsville, Tex.
Belton, Tex.	Longview, Tex.
Brenham, Tex.	Luling, Tex.
Columbia, Tex.	Orange, Tex.
Corsicana, Tex.	Sour Lake, Tex.
Cuero, Tex.	Tyler, Tex,
Dallas, Tex.	Waco, Tex.
Hearne, Tex.	Weatherford, Tex.
Houston, Tex.	Weimar, Tex.

Vicksburg, Mississippi, (center).

Edwards, Miss.	Lake, Miss.
Jackson, Miss.	Monroe, La.

Little Rock, Arkansas (center).

Arkansas City, Ark.	Monticello, Ark.
Brinkley, Ark.	Newport, Ark.
Devall's Bluff, Ark.	Paris, Tex.
Forrest City, Ark.	Pine Bluff, Ark.
Helena, Ark.	Prescott, Ark.
Kensett, Ark.	Russellville, Ark.
Magnolia, Ark.	Texarkana, Ark.
Malvern, Ark.	

Memphis, Tennessee (center).

Arlington, Tenn.	Grenada, Miss.
Batesville, Miss.	Hernando, Miss.
Bolivar, Tenn.	Holly Springs, Miss.
Brownsville, Tenn.	Milan, Tenn.
Corinth, Miss.	Oxford, Miss.
Covington, Tenn.	Paris, Tenn.
Decatur, Ala.	Scottsborough, Ala.
Dyersburg, Tenn.	Tuscumbia, Ala.
Grand Junction, Tenn.	

CITIES AT WHICH THE COLD-WAVE SIGNAL IS DISPLAYED.

(Not Signal Service stations.)

Flags furnished by the Signal Service.

Auburn, Ala.	Northfield, Minn.
Kansas City, Mo.	Richmond, Va.
Madison, Wis.	Wellington, Kans.

APPENDIX 28.

Monthly and yearly meteorological summaries at stations of the Signal Service, United States Army.

ABILENE, TEX.

[Latitude, 32° 14′ N.; longitude, 99° 45′ W. Local time, 1.39 slow, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a. m.	Temperature. 3 p. m.	Temperature. 11 p. m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew point. 7 a. m.	Dew point. 3 p. m.	Dew point. 11 p. m.	Dew point. Mean.	Relative humidity. 7 a. m.	Relative humidity. 3 p. m.	Relative humidity. 11 p. m.	Relative humidity. Mean.
	In.	In.	In.	°	°	°	°	°	°	°	°	°	°	°	°				
J..	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
F..	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
M..	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
A..	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
M..	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
J..	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
J..	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
A..	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
S..	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
O..	28.256	28.58	27.98	53.4	72.9	61.2	62.5	93	36	76.8	51.6	46.7	50.7	48.6	48.7	79	47	65	64
N..	28.227	28.58	27.68	47.3	66.6	54.6	56.2	86	27	69.7	45.7	41.2	47.8	44.9	44.6	80	53	71	68
D..	28.300	28.60	27.64	42.2	58.6	47.4	49.4	80	15	62.4	38.6	36.5	41.2	39.0	38.9	81	55	74	70
Y..	.....	.....	.....	.....	.....	.....	.....	..	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

ALBANY, N. Y.

[Latitude, 42° 39′ N.; longitude 73° 45′ W. Local time, 0.05 fast, Eastern.]

J..	29.996	30.73	29.14	19.2	25.3	20.5	21.7	57	-10	31.2	14.5	11.6	13.2	13.7	12.8	72	60	74	69
F..	29.909	30.40	29.05	10.4	19.5	14.1	14.7	45	-10	25.4	5.1	4.6	10.3	8.0	7.6	77	67	76	73
M.	29.950	30.37	29.44	18.8	28.5	22.1	23.1	49	- 5	32.4	15.0	11.5	14.6	13.9	13.3	73	57	71	67
A..	29.946	30.51	29.44	40.3	53.2	42.4	45.3	85	23	57.3	35.2	31.7	31.3	32.6	31.9	72	47	69	62
M.	29.905	30.18	29.52	52.2	65.5	54.0	57.2	86	32	67.8	46.7	41.7	41.4	42.8	42.0	68	45	68	60
J..	29.889	30.20	29.39	62.7	74.8	63.7	67.1	90	46	77.9	56.4	52.8	50.6	52.8	52.1	71	45	69	62
J..	29.878	30.15	29.62	68.3	80.5	70.1	73.0	97	50	83.6	62.6	59.0	58.3	59.2	58.8	72	49	69	64
A..	29.895	30.19	29.55	63.1	73.7	64.7	67.2	88	46	77.0	59.7	55.6	56.9	57.8	56.8	77	58	79	71
S..	29.965	30.27	29.29	53.8	69.2	56.9	60.0	84	41	71.8	50.7	49.2	50.8	51.7	50.6	85	53	83	74
O..	29.952	30.27	29.32	46.0	56.9	48.0	50.3	78	28	59.7	42.3	41.4	42.6	42.4	42.1	85	60	81	75
N..	29.863	30.31	29.52	37.6	44.5	39.8	40.6	68	15	46.9	34.7	32.3	33.4	33.4	33.0	81	66	78	75
D..	29.916	30.65	29.04	27.6	33.2	29.7	30.2	57	9	38.0	23.5	21.8	23.3	24.0	23.0	79	67	79	75
Y..	29.922	30.73	29.04	41.7	52.1	43.8	45.9	97	-10	55.8	37.2	34.4	35.6	36.0	35.3	76	56	75	69

ALPENA, MICH.

[Latitude, 45° 5′ N.; longitude, 83° 30′ W. Local time, 0.34 slow, Eastern.]

J..	29.292	29.87	28.44	9.0	16.8	11.4	12.4	37	-19	20.0	4.5	3.9	10.4	6.4	6.9	79	76	80	78
F..	29.238	29.79	28.61	2.0	13.8	7.2	7.7	37	-23	17.6	-2.4	-3.9	6.7	1.8	1.5	75	73	78	75
M.	29.302	29.74	28.46	6.4	20.4	12.4	13.1	43	-16	25.0	1.8	1.1	13.0	6.9	7.0	78	73	78	76
A..	29.345	29.73	28.78	30.4	40.0	33.6	34.7	79	9	45.3	27.2	25.9	30.6	27.9	28.1	83	70	80	78
M.	29.243	29.54	28.78	44.4	50.8	44.2	46.5	78	25	56.3	39.4	39.1	42.0	40.5	40.5	83	74	87	81
J..	29.312	29.50	28.92	55.7	63.9	55.2	58.3	87	37	70.8	47.7	48.8	50.0	49.3	49.6	78	66	81	75
J..	29.282	29.61	29.05	61.0	69.7	63.3	64.7	88	44	75.5	55.9	56.5	59.1	58.3	58.0	85	71	85	80
A..	29.306	29.63	28.76	55.3	64.7	57.4	59.1	81	42	68.2	51.7	52.2	55.4	52.9	53.5	90	73	86	83
S..	29.350	29.60	28.94	50.4	62.0	53.9	55.4	88	35	65.9	47.2	46.3	48.7	49.5	48.2	87	64	86	79
O..	29.307	29.63	28.83	38.8	47.3	41.4	42.5	63	20	50.9	36.5	36.2	40.6	39.0	38.6	90	79	91	87
N..	29.245	29.70	28.79	33.5	38.5	34.4	35.5	64	22	41.0	31.1	30.5	33.8	31.4	31.9	88	84	89	87
D..	29.272	29.99	28.47	22.8	27.0	23.0	24.3	46	- 5	30.3	18.5	19.8	22.0	19.9	20.6	88	81	87	85
Y..	29.291	29.87	28.44	34.1	42.9	36.4	37.8	88	-23	47.2	20.9	29.7	34.4	32.0	32.0	84	74	84	80

* This appendix contains data from form 127*b* for the year ending December 31, 1885. All observa underneath. Large *H* represents the height of the barometer above sea-level, and small *h* the height

APPENDIX 28.

Monthly and yearly meteorological summaries at stations of the Signal Service, United States Army.

ABILENE, TEX.

[$H=1{,}744$. $h=38$.]

Cloudiness (in tenths).				Wind.												Precipitation.		Number of days—									
7 a.m.	3 p.m.	11 p.m.	Mean.	Total (miles).	Maximum.	Direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Total.	Max. 24 hours.	Clear.	Fair.	Cloudy.	Rain or snow.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder-storms.	Auroras.	Months and year.
																In.	*In.*										
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	J.
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	F.
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	M.
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	A.
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	M.
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	J.
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	J.
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	A.
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	S.
2.7	2.6	1.6	2.4	6,912	30	S.	17	5	1	7	20	22	3	12	6	2.61	1.82	20	9	2	2	0	0	3	2	0	O.
3.4	3.2	1.5	2.7	6,585	32	SW.	6	3	4	9	20	21	4	13	8	0.23	0.18	17	11	2	3	0	2	0	0	0	N.
4.0	3.4	2.7	3.4	7,833	40	NW.	6	2	1	9	21	23	4	14	13	0.96	0.85	18	6	7	[illegible]	0	0	9	0	0	D.
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	Y.

ALBANY, N. Y.

[$H=83$. $h=100$.

ALPENA, MICH.

[$H=609$. $h=53$.]

tions are by eastern time. Appropriate headings show the data contained in the columns immediately of the rain-gauge above ground.

Monthly and yearly meteorological summaries—Continued.

APACHE, FORT, ARIZ.

[Latitude, 33° 48′ N.; longitude, 109° 57′ W. Local time, 2.20 slow, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a. m.	Temperature. 3 p. m.	Temperature. 11 p. m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew point. 7 a. m.	Dew point. 3 p. m.	Dew point. 11 p. m.	Dew point. Mean.	Relative humidity. 7 a. m.	Relative humidity. 3 p. m.	Relative humidity. 11 p. m.	Relative humidity. Mean.
	In.	*In.*	*In.*	°	°	°	°	°	°	°	°	°	°	°	°				
J ..	25.074	25.32	24.80	23.5	43.3	30.7	32.5	59	− 4	47.7	18.1	16.2	30.9	23.6	23.6	74	65	75	71
F ..	25.006	25.29	24.69	27.2	53.0	38.5	39.6	67	12	57.9	24.2	22.3	31.0	27.8	27.0	82	46	67	65
M .	25.142	25.33	24.93	36.2	58.9	46.3	47.1	72	22	63.3	33.7	30.7	36.3	35.1	34.0	81	46	68	65
A ..	24.977	25.18	24.81	41.9	65.9	52.0	53.3	81	24	69.9	37.1	29.9	34.8	32.4	32.4	65	34	49	49
M .	24.970	25.08	24.81	45.0	73.8	57.4	58.7	91	34	78.3	41.3	29.5	38.4	36.7	34.9	57	30	50	46
J ..	25.059	25.21	24.85	49.5	80.7	64.6	64.9	94	33	85.8	45.3	33.2	45.0	41.1	39.8	55	32	44	44
J ..	25.102	25.22	25.00	59.7	86.9	72.5	73.0	101	44	92.3	56.5	49.2	50.3	52.5	50.7	71	32	54	52
A ..	25.095	25.19	25.01	59.6	82.6	69.3	70.5	98	50	87.6	57.6	53.6	56.7	57.6	56.0	81	44	68	64
S ..	25.066	25.21	24.93	52.4	81.6	63.9	66.0	93	38	85.4	48.4	40.2	44.8	43.1	42.7	65	28	48	47
O ..	25.082	25.19	24.82	41.1	74.0	53.8	56.3	87	30	77.5	37.6	28.3	35.3	31.5	31.7	61	26	45	44
N ..	25.071	25.26	24.68	37.2	60.6	44.7	47.5	77	22	64.5	32.0	28.6	35.5	33.1	32.4	72	41	66	60
D ..	25.104	25.38	24.72	28.7	52.6	37.4	39.6	68	13	57.3	24.1	23.9	32.0	28.6	28.2	82	48	71	67
Y ..	25.062	25.38	24.68	41.8	67.8	52.6	54.1	101	− 4	72.3	38.0	32.1	39.2	36.9	36.1	70	39	59	56

ASSINABOINE, FORT, MONT.

[Latitude, 48° 32′ N.; longitude, 109° 42′ W. Local time, 2.19 slow, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a. m.	Temperature. 3 p. m.	Temperature. 11 p. m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew point. 7 a. m.	Dew point. 3 p. m.	Dew point. 11 p. m.	Dew point. Mean.	Relative humidity. 7 a. m.	Relative humidity. 3 p. m.	Relative humidity. 11 p. m.	Relative humidity. Mean.
J ..	27.135	27.68	26.55	8.9	14.1	12.9	12.0	46	−30	21.4	1.9	− 1.0	3.3	4.0	2.1	67	66	70	68
F ..	27.108	27.57	26.52	13.1	22.1	17.4	17.5	51	−17	27.5	8.6	7.3	11.6	10.2	9.7	79	66	74	73
M .	27.224	27.51	26.92	33.7	45.1	39.9	39.6	68	15	52.8	29.8	27.6	33.2	30.1	30.3	79	65	69	71
A ..	27.122	27.47	26.61	36.7	51.9	47.1	45.2	78	17	58.5	33.8	30.6	35.4	34.4	33.5	79	57	63	66
M .	27.094	27.45	26.74	43.7	62.2	55.5	53.8	83	18	67.9	38.9	35.7	35.8	39.5	37.0	74	39	57	57
J ..	....	......	......	.....	.....	.....	.....	...	...	.....	.....	......	.....	.....	.....	...	...	...	...
J ..	27.157	27.40	26.93	56.0	73.5	67.0	65.5	96	41	79.7	53.5	46.7	47.7	50.4	48.3	72	43	59	58
A ..	27.204	27.46	26.91	54.3	72.5	63.9	63.6	96	41	78.1	50.7	46.0	50.8	48.6	48.6	75	49	61	62
S ..	27.104	27.40	26.66	47.9	67.3	66.6	57.3	93	36	72.3	43.9	36.7	41.9	40.0	39.5	66	41	55	54
O ..	27.180	27.55	26.78	37.4	56.5	45.9	46.6	83	19	61.7	32.3	26.2	33.3	29.7	29.7	65	43	54	54
N ..	27.025	27.35	26.65	33.1	48.4	39.3	40.3	64	15	52.3	25.6	23.2	29.9	27.8	27.0	67	50	64	60
D ..	27.098	27.59	26.67	29.9	37.3	31.8	33.0	68	− 6	43.8	21.0	18.4	21.8	18.6	19.6	63	55	59	59
Y ..	....	......	......	.....	.....	.....	.....	...	...	.....	.....	......	.....	.....	.....	...	...	...	...

ATLANTA, GA.

[Latitude, 33° 45′ N.; longitude, 84° 23′ W. Local time, 0.37 slow, Eastern]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a. m.	Temperature. 3 p. m.	Temperature. 11 p. m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew point. 7 a. m.	Dew point. 3 p. m.	Dew point. 11 p. m.	Dew point. Mean.	Relative humidity. 7 a. m.	Relative humidity. 3 p. m.	Relative humidity. 11 p. m.	Relative humidity. Mean.
J ..	29.003	29.42	28.51	34.9	45.1	39.7	39.9	64	14	48.4	31.6	27.1	28.5	29.6	28.4	74	56	69	66
F ..	28.854	29.20	28.27	33.9	45.5	39.0	39.5	69	8	48.1	30.3	25.3	28.1	25.2	26.2	71	54	59	62
M .	28.922	29.30	28.62	40.7	54.2	46.1	47.0	69	20	56.2	38.1	29.7	30.6	30.9	30.4	66	45	57	56
A ..	28.906	29.30	28.64	54.0	69.0	60.2	61.1	83	36	70.5	51.5	44.4	40.2	42.8	42.5	71	39	55	55
M .	28.807	29.02	28.46	60.9	72.3	65.2	66.1	83	46	74.8	58.9	53.8	52.9	54.4	53.7	79	56	71	69
J ..	28.919	29.10	28.70	71.8	82.3	75.2	76.4	90	57	84.0	69.2	65.5	63.7	66.9	65.4	81	55	76	71
J ..	28.892	29.09	28.69	72.9	84.5	77.1	78.2	91	59	86.5	71.1	68.3	66.6	69.7	68.2	86	56	79	74
A ..	28.861	29.04	28.67	71.5	82.8	75.2	76.5	90	59	84.6	69.7	67.3	65.8	67.9	67.0	87	58	79	75
S ..	28.893	29.11	28.67	64.9	75.0	68.5	69.5	87	53	76.4	63.8	62.0	62.1	63.7	62.6	91	67	85	81
O ..	28.839	29.11	28.41	50.7	63.3	55.6	56.5	74	37	64.9	49.0	48.0	47.8	48.7	48.2	91	60	79	76
N ..	28.866	29.16	28.51	45.2	56.2	49.1	50.2	73	29	58.5	42.5	39.8	39.1	39.4	39.4	82	57	71	70
D ..	28.971	29.37	28.44	36.7	49.4	41.9	42.9	69	21	51.6	34.1	28.8	28.3	28.7	28.6	74	48	62	61
Y ..	28.894	29.42	28.27	53.2	65.0	57.7	58.6	91	8	67.0	50.8	46.7	46.1	47.3	46.7	79	54	70	68

ATLANTIC CITY, N. J.

[Latitude, 39° 22′ N.; longitude, 74° 25′ W. Local time, 0.03 fast, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a. m.	Temperature. 3 p. m.	Temperature. 11 p. m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew point. 7 a. m.	Dew point. 3 p. m.	Dew point. 11 p. m.	Dew point. Mean.	Relative humidity. 7 a. m.	Relative humidity. 3 p. m.	Relative humidity. 11 p. m.	Relative humidity. Mean.
J ..	30.092	30.81	29.43	30.9	34.9	31.0	32.3	53	7	39.9	24.0	26.5	29.6	26.8	27.6	84	81	84	83
F ..	29.953	30.48	29.14	23.4	29.0	24.7	25.7	48	5	33.2	18.3	19.7	22.3	19.4	20.5	85	77	80	81
M .	30.026	30.46	29.60	28.0	35.8	30.4	31.4	55	8	38.7	24.8	22.7	30.7	26.4	26.6	81	82	85	83
A ..	30.014	30.59	29.46	44.0	52.1	43.8	46.6	75	29	54.6	39.2	39.6	44.6	40.6	41.6	85	77	89	83
M .	29.933	30.22	29.52	53.3	58.4	52.7	54.8	75	35	61.5	49.3	51.2	53.5	50.2	51.0	93	85	91	90
J ..	29.989	30.31	29.46	64.4	72.3	63.5	66.7	87	52	74.8	59.3	60.5	64.4	59.5	61.5	88	77	87	84
J ..	29.946	30.20	29.65	71.9	77.2	71.0	73.4	91	57	80.4	67.7	68.3	70.5	68.2	69.0	89	81	91	87
A ..	29.970	30.25	29.66	70.5	77.7	71.2	73.1	89	49	80.3	66.4	66.0	68.6	67.6	67.4	86	75	89	83
S ..	30.074	30.36	29.40	61.8	69.1	63.1	64.7	81	44	71.6	58.4	57.0	59.1	57.9	58.0	84	72	84	80
O ..	30.014	30.30	29.08	53.4	59.7	54.4	55.8	74	34	63.0	49.2	50.3	52.5	51.0	51.3	90	78	89	86
N ..	29.944	30.34	29.54	43.6	50.0	45.6	46.4	65	27	53.3	39.3	39.4	41.6	41.6	40.9	85	70	87	83
D ..	30.025	30.71	29.25	34.7	40.2	35.9	36.9	53	12	44.8	28.6	30.4	33.1	31.4	31.6	84	77	84	82
Y ..	29.998	30.81	29.08	48.3	54.7	48.9	50.6	91	5	58.0	43.7	44.3	47.5	45.0	45.6	86	78	87	84

Monthly and yearly meteorological summary—Continued.

APACHE, FORT, ARIZ.

[H=5,050. h=1.]

Cloudiness (in tenths).				Wind.													Precipitation.		Number of days—									
7 a.m.	3 p.m.	11 p.m.	Mean.	Total (miles).	Maximum.	Direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Total.	Max. 24 hours.	Clear.	Fair.	Cloudy.	Rain or snow.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder-storms.	Auroras.	Months and year.
																In.	In.										
2.2	4.4	1.7	2.1	2,814	20	SE.	6	17	26	8	0	12	15	4	6	0.52	0.37	14	16	1	5	0	29	0	0	0	J.
1.7	3.5	2.1	2.4	2,764	30	SW.	6	28	14	1	2	0	15	4	5	1.00	0.74	17	8	3	4	0	23	0	0	0	F.
2.5	6.0	3.1	4.2	4,080	27	NE.	6	37	12	8	3	10	6	0	2	2.05	1.07	13	13	5	9	0	13	0	0	0	M.
2.6	3.5	2.2	2.8	5,648	34	S.	0	29	11	6	7	19	16	2	0	0.52	0.43	16	12	2	8	0	4	0	0	0	A.
2.3	3.8	1.8	2.6	5,061	31	SE.	2	30	15	9	4	23	7	1	2	1.12	0.84	20	10	1	8	0	0	2	3	0	M.
1.6	2.6	2.5	2.6	4,663	29	SW.	0	15	19	4	1	23	6	0	22	0.82	0.48	17	10	3	5	0	0	7	0	0	J.
2.9	5.1	4.7	4.2	3,875	36	SW.	3	9	22	5	2	27	7	2	16	2.60	1.21	12	15	4	11	0	0	20	6	0	J.
3.7	5.7	3.5	4.3	4,219	33	NW.	7	16	23	16	3	13	11	1	8	3.16	1.01	11	15	5	9	0	0	9	6	0	A.
1.5	2.9	1.0	1.8	4,741	25	SW.	0	20	31	3	3	19	12	2	0	0.44	0.24	21	9	0	4	0	0	3	1	0	S.
0.4	1.7	0.6	0.9	4,607	28	E.	1	38	21	4	2	20	3	2	2	0.86	0.33	26	5	0	2	0	7	0	0	0	O.
2.1	4.6	2.6	2.4	3,716	32	SW.	4	26	16	4	2	23	8	2	10	1.56	0.68	15	12	3	6	0	16	0	0	0	N.
2.8	3.5	2.2	2.8	3,318	33	NE.	7	28	19	9	4	24	5	1	2	1.41	0.86	17	9	5	6	0	29	0	1	0	D.
2.4	4.0	2.3	2.9	50,540	...	....	42	293	223	77	33	231	106	21	69	15.58	1.21	199	134	32	74	0	118	41	17	0	Y.

ASSINABOINE, FORT, MONT.

[H=2,720. h=4.]

ATLANTA, GA.

[H=1,120. h=74.]

ATLANTIC CITY, N. J.

[H=13. h=27.]

Monthly and yearly meteorological summaries—Continued.

AUGUSTA, GA.

[Latitude, 33° 28′ N.; longitude, 81° 54′ W. Local time, 0.27 slow, Eastern.]

Months and year.	Pressure.			Temperature.						Mean.		Dew point.				Relative humidity.			
	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.
	In.	In.	In.	°	°	°	°	°	°	°	°	°	°	°	°				
J ..	30.037	30.53	29.61	39.9	51.8	44.6	45.4	76	22	56.0	36.4	34.5	30.9	35.7	33.7	82	51	73	68
F ..	29.8[illegible]6	30.32	29.27	35.7	50.9	41.4	42.7	74	15	54.5	33.7	30.5	28.9	33.3	30.9	82	48	75	68
M .	29.945	30.38	29.50	41.1	59.3	48.2	49.5	76	26	62.5	39.6	37.0	33.8	39.3	36.7	85	43	73	67
A ..	29.918	30.34	29.55	54.2	74.2	60.7	63.0	93	35	77.6	51.4	49.2	43.9	49.8	47.6	84	38	69	64
M .	29.799	30.03	29.49	64.2	79.1	66.8	70.0	92	47	83.0	60.4	58.7	56.2	59.5	58.1	83	49	79	70
J ..	29.896	30.10	29.03	72.7	86.9	73.9	77.8	99	58	91.0	68.5	67.6	64.3	67.9	66.6	85	49	82	72
J ..	29.850	30.06	29.61	74.9	89.8	77.5	80.7	101	62	93.5	71.8	70.1	67.9	70.9	69.3	86	49	81	72
A ..	29.822	30.00	29.57	73.6	87.6	76.3	79.2	99	64	92.4	70.9	69.6	67.1	70.4	69.0	88	53	83	75
S ..	29.869	30.09	29.59	68.8	81.2	71.3	73.8	95	52	84.3	66.6	65.1	64.9	66.8	65.6	89	61	86	79
O ..	29.824	30.12	29.27	52.7	69.4	57.2	59.8	82	38	72.2	50.4	50.5	50.4	53.8	51.6	92	54	89	78
N ..	20.868	30.21	29.52	43.8	63.4	49.9	52.4	83	28	66.3	41.2	41.8	42.6	45.6	43.3	93	50	86	76
D ..	29.976	30.48	29.43	37.0	56.0	42.1	45.0	72	23	59.2	33.6	32.5	28.9	35.8	32.4	85	40	80	68
Y ..	29.891	30.53	29.27	54.9	70.8	59.2	61.6	101	15	74.4	52.0	50.6	48.2	52.4	50.4	86	49	80	72

BALTIMORE, MD.

[Latitude, 39° 18′ N.; longitude, 76° 37′ W. Local time, 0.06 slow, Eastern.]

J ..	30.105	30.80	29.46	31.5	36.9	33.5	34.0	65	10	42.0	26.8	21.6	23.5	23.3	22.8	67	60	66	64
F ..	29.975	30.46	29.24	25.2	32.3	27.9	28.5	50	3	35.5	22.2	16.6	17.8	17.4	17.3	70	55	65	63
M .	30.023	30.42	29.58	30.9	40.3	34.7	35.3	68	12	42.6	28.4	20.9	20.4	22.2	21.2	67	46	60	[illegible]
A ..	30.009	30.56	29.52	47.9	61.7	53.0	54.2	81	31	64.0	45.8	35.8	37.8	38.9	37.5	61	44	60	[illegible]
M .	29.919	30.16	29.50	59.3	68.8	61.0	63.0	82	44	71.2	55.8	49.4	48.9	49.9	49.4	72	54	69	65
J ..	29.983	30.27	29.49	68.7	78.9	70.1	72.6	95	56	82.3	64.3	57.1	56.0	59.1	57.4	68	48	69	62
J ..	29.928	30.15	29.67	75.1	86.4	77.3	79.6	99	56	88.8	71.8	64.9	63.4	67.0	65.1	71	48	71	63
A ..	29.936	30.21	29.58	70.5	81.1	72.1	74.6	93	53	83.1	67.4	63.0	61.8	64.7	63.2	78	53	78	70
S ..	30.040	30.33	29.48	61.6	74.4	64.7	66.9	86	46	75.5	59.2	53.3	55.3	56.5	55.0	74	53	75	[illegible]
O ..	29.973	30.30	29.08	51.4	61.2	53.6	55.4	76	38	64.7	48.3	46.7	46.3	47.4	46.8	85	60	80	75
N ..	29.930	30.34	29.58	42.0	50.4	44.5	45.6	73	32	53.0	39.8	34.9	35.7	36.1	35.6	76	60	74	70
D ..	30.011	30.75	29.30	33.9	42.4	36.4	37.6	64	15	45.9	31.0	24.0	24.8	26.0	24.9	67	52	66	62
Y ..	29.986	30.80	29.08	49.8	59.6	52.4	53.9	99	3	62.4	46.7	40.7	41.0	42.4	41.4	72	53	70	65

BARNEGAT CITY, N. J.

[Latitude, 39° 46′ N.; longitude, 74° 6′ W. Local time, 0.04 fast, Eastern.]

J ..	30.092	30.80	29.30	31.7	35.7	32.4	33.3	59	9	41.3	25.0	27.7	28.9	27.5	28.0	85	77	82	81
F ..	29.965	30.49	29.09	24.6	30.3	26.1	27.0	54	5	35.4	19.8	19.2	24.7	21.5	21.8	80	79	82	80
M .	30.029	30.48	29.57	29.6	36.3	31.1	32.3	55	9	41.3	25.6	23.8	27.2	26.6	25.9	79	70	83	78
A ..	30.012	30.59	29.44	45.4	51.8	45.4	47.5	72	28	55.6	39.4	38.5	41.5	40.1	40.0	77	70	82	77
M .	29.946	30.23	29.52	53.4	57.4	53.0	54.6	75	39	61.1	48.4	49.5	50.1	49.8	49.8	87	78	89	85
J ..	29.987	30.29	29.43	65.1	71.1	62.8	66.3	90	53	74.5	58.6	58.5	60.5	58.2	59.1	80	71	86	79
J ..	29.947	30.19	29.69	73.8	76.2	71.1	73.7	92	56	80.0	67.8	67.2	68.3	68.0	67.8	80	77	90	83
A ..	29.958	30.25	29.68	71.2	76.4	70.4	72.7	89	52	79.5	66.3	66.1	67.8	66.2	66.7	84	76	87	82
S ..	30.047	30.37	29.40	62.8	68.5	63.2	64.8	82	43	71.2	58.8	58.0	59.9	58.2	58.7	85	75	84	81
O ..	29.989	30.29	29.09	54.7	60.1	55.3	56.7	74	36	63.9	50.5	51.2	53.8	52.1	52.4	88	80	89	86
N ..	29.919	30.33	29.55	44.3	50.9	46.0	47.1	65	31	52.6	41.4	40.5	48.5	42.1	42.0	86	76	87	83
D ..	29.996	30.72	29.23	35.2	40.8	37.9	38.0	56	14	45.5	31.0	30.0	34.4	32.6	32.8	81	78	81	80
Y ..	29.990	30.80	29.09	49.3	54.6	49.6	51.2	92	5	58.5	44.4	44.2	46.7	45.2	45.4	83	76	85	81

BENNETT, FORT, DAK.

[Latitude, 44° 43′ N.; longitude, 100° 39′ W. Local time, 1.42 slow, Eastern.]

J ..	28.508	29.03	28.00	- 0.8	10.4	5.2	4.9	49	-40	16.2	- 7.9	- 4.9	4.3	0.8	0.1	82	77	83	81
F ..	28.452	28.89	27.99	6.2	16.0	9.9	10.7	51	-27	21.4	0.5	1.4	8.5	4.1	4.7	81	73	77	77
M .	28.512	28.90	28.18	25.2	41.8	31.1	32.7	63	4	46.6	22.9	19.5	24.9	23.0	22.5	79	58	73	68
A ..	28.346	28.75	27.78	36.7	57.6	46.8	47.0	78	19	62.3	35.7	30.2	32.5	34.5	32.4	77	44	65	62
M .	28.347	28.68	28.00	47.0	66.1	56.1	56.4	87	25	70.7	45.8	40.7	43.0	44.5	42.7	79	47	67	64
J ..	28.379	28.74	27.62	56.7	74.6	64.7	65.3	90	38	78.3	55.2	52.3	56.2	55.7	54.7	86	55	74	71
J ..	28.342	28.62	27.84	65.1	83.1	73.0	73.7	102	45	87.4	63.4	58.1	58.3	60.5	59.0	79	45	66	63
A ..	28.425	28.71	28.05	58.2	74.3	65.6	66.0	97	45	78.3	56.7	52.9	55.1	56.7	54.9	83	55	74	71
S ..	28.381	28.75	27.98	49.9	71.4	58.6	60.0	94	34	73.8	49.2	44.4	48.6	49.0	47.3	83	47	72	67
O ..	28.439	28.71	27.92	33.5	58.8	42.6	45.0	83	18	62.2	31.5	27.4	31.7	31.2	30.1	79	39	65	61
N ..	28.361	28.72	27.86	27.2	41.5	32.1	33.6	54	12	43.6	25.7	24.0	30.6	27.2	27.8	87	66	82	78
D ..	......	......	......	......	......	......	......	...	...	......	......	......	......	......	......	...	...	...	...
Y ..	......	......	......	......	......	......	......	...	...	......	......	......	......	......	......	...	...	...	...

Monthly and yearly meteorological summaries—Continued.

AUGUSTA, GA.
[H=180. h=39.]

Cloudiness (in tenths).				Wind.												Precipitation.		Number of days—									
7 a. m.	3 p. m.	11 p. m.	Mean.	Total (miles).	Maximum.	Direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Total.	Max. 24 hours.	Clear.	Fair.	Cloudy.	Rain or snow.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder-storms.	Auroras.	Months and year.
																In.	In.										
6.5	6.3	6.8	6.4	3,905	26	SW.	8	21	0	5	6	6	20	10	11	7.55	2.40	8	5	14	18	0	9	0	0	0	J.
5.9	4.5	2.4	4.3	3,270	20	W.	7	11	0	6	11	8	20	11	10	3.24	0.57	15	4	9	10	0	14	0	1	0	F.
4.7	5.4	3.5	4.5	3,189	18	W.	5	7	4	7	9	12	20	13	16	1.85	0.73	11	12	8	10	0	4	0	2	0	M.
4.0	4.5	2.8	3.8	2,902	20	N.	6	13	4	13	13	7	11	11	12	1.68	0.43	14	12	4	7	0	0	1	1	0	A.
5.4	5.3	3.4	5.0	3,589	28	N.	3	13	5	18	9	10	16	13	6	5.80	1.97	9	15	7	11	0	0	4	5	0	M.
5.1	5.7	3.4	4.7	2,216	26	SW.	5	8	10	18	21	8	8	8	9	2.60	0.50	8	18	4	11	0	0	21	8	0	J.
5.5	5.8	3.5	4.9	2,256	23	S.	6	12	12	8	21	12	7	6	9	3.69	2.70	8	19	4	7	0	0	24	8	0	J.
5.9	5.3	4.2	4.8	2,814	19	S.	8	16	8	17	11	7	7	5	12	3.38	1.63	7	19	5	10	0	0	23	2	0	A.
6.8	7.0	5.0	6.3	3,154	19	NE.	6	38	6	5	7	2	3	5	18	2.78	0.65	7	11	12	12	0	0	7	1	0	S.
3.7	4.7	2.6	3.7	3,126	25	SW.	3	21	4	7	3	8	19	14	16	4.15	1.44	16	10	5	10	0	0	0	0	0	O.
3.8	4.3	2.6	3.6	2,049	18	SW.	3	6	0	7	6	7	19	18	22	1.55	0.47	14	14	2	8	0	2	0	2	0	N.
4.0	4.1	3.2	3.8	3,101	20	N.	4	9	2	8	4	11	25	11	24	2.14	1.38	13	13	5	5	0	13	0	0	0	D.
5.0	5.4	3.6	4.7	34,615	...	....	64	177	55	114	124	93	174	125	165	40.67	2.70	130	162	79	114	0	42	80	30	0	Y.

BALTIMORE, MD.
[H=45. h=69.]

BARNEGAT CITY, N. J.
[H=23. h=39.]

BENNETT, FORT, DAK.
[H=1,510. h=18.]

3.9	5.4	3.1	4.1	3,296	38	NW.	7	8	0	9	1	4	3	23	30	0.14	0.06	11	15	5	5	24	31	0	0	0	J.
6.4	6.5	4.0	5.6	4,219	36	NW.	12	7	9	11	0	3	8	24	15	0.21	0.06	6	14	8	10	21	28	0	0	0	F.
5.9	6.9	3.6	5.5	6,451	48	NW.	24	16	3	10	7	2	6	20	5	0.13	0.10	5	21	5	8	3	28	0	0	0	M.
4.8	5.7	4.5	5.0	7,634	42	S.	30	9	4	16	13	1	2	8	7	1.84	0.71	9	15	6	7	0	10	0	2	0	A.
4.7	5.7	5.0	5.1	7,435	40	N.	23	8	9	16	12	4	9	8	3	2.40	0.78	9	16	7	10	0	6	0	0	1	M.
5.8	4.8	6.4	5.7	6,321	44	W.	10	8	9	24	16	6	7	9	1	5.62	1.80	4	18	8	14	0	0	0	13	2	J.
5.1	4.6	5.1	4.6	6,596	44	NW.	14	9	10	12	23	7	5	13	0	1.55	1.16	9	18	4	9	0	0	13	9	0	J.
5.3	5.6	4.0	5.0	5,446	35	SE.	21	8	10	19	16	6	4	10	0	5.87	2.27	11	11	9	11	0	0	4	10	0	A.
3.9	3.8	3.5	3.7	4,964	29	N.	22	4	2	17	17	5	7	15	1	1.47	0.63	15	9	6	6	0	0	2	1	2	S.
4.0	4.4	3.0	3.8	4,798	40	NW.	21	8	4	5	20	1	5	23	1	0.14	0.06	15	10	6	4	0	16	0	0	1	O.
6.3	5.7	4.6	5.2	5,442	44	N.	20	4	2	29	11	4	6	14	0	0.28	0.19	7	17	6	8	1	20	0	0	1	N.
...	...	...	...	.....	...	....	...	...	...	...	...	...	...	...	...	.....	.....	...	...	...	...	...	...	...	...	...	D.
...	...	...	...	.....	...	....	...	...	...	...	...	...	...	...	...	.....	.....	...	...	...	...	...	...	...	...	...	Y.

Monthly and yearly meteorological summaries—Continued.

BENTON, FORT, MONT.

[Latitude, 47° 50′ N.; longitude, 110° 40′ W. Local time, 2.22 slow, Eastern.]

Months and year.	Pressure.			Temperature.						Mean.		Dew point.				Relative humidity.			
	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.
	In.	In.	In.	°	°	°	°	°	°	°	°	°	°	°	°				
J ..	27.201	27.76	26.65	8.3	19.1	13.8	13.7	52	-38	24.9	-0.1	2.1	10.6	5.7	6.1	77	71	72	73
F ..	27.175	27.64	26.53	17.8	29.6	22.1	23.2	58	-21	35.4	13.3	8.2	17.2	12.7	12.7	68	62	68	66
M ..	27.297	27.54	27.01	32.2	51.5	41.3	41.7	71	18	56.8	30.8	22.9	27.2	29.4	26.5	68	42	63	58
A ..	27.187	27.53	26.71	36.2	55.0	46.7	46.0	79	20	61.1	33.5	25.7	31.0	31.1	29.3	66	44	56	55
M ..	27.157	27.53	26.83	48.8	66.6	56.0	57.0	89	22	71.9	41.6	37.7	40.5	41.1	39.8	67	40	60	56
J ..	27.196	27.52	26.69	52.1	72.5	63.2	62.6	98	38	78.7	50.6	43.9	53.9	52.7	50.2	74	65	71	67
J ..	27.231	27.46	27.03	56.0	76.8	67.8	66.9	103	44	83.2	54.1	48.0	50.8	52.8	50.5	76	44	62	60
A ..	27.265	27.52	26.97	52.6	76.0	65.5	64.7	105	41	81.6	51.3	44.2	46.2	46.6	45.7	75	39	54	56
S ..	27.170	27.48	26.72	45.9	70.4	57.4	57.9	93	34	74.6	44.2	37.2	40.2	39.3	38.9	73	36	53	54
O ..	27.225	27.59	26.84	35.4	62.1	46.7	48.1	78	22	63.7	33.6	29.3	39.2	34.6	34.4	78	45	64	62
N ..	27.072	27.43	26.68	31.1	52.9	39.8	41.3	68	16	56.1	28.1	25.8	36.1	31.6	31.2	81	65	73	70
D ..	27.170	27.65	26.78	29.9	42.8	34.1	35.6	73	1	47.6	24.8	23.2	28.3	26.5	26.0	77	58	75	70
Y ..	27.196	27.76	26.53	37.2	56.3	46.2	46.6	105	38	61.3	33.8	29.0	35.1	33.7	32.7	73	49	64	62

BIDWELL, FORT, CAL.

[Latitude, 41° 58′ N.; longitude, 120° 11′ W. Local time, 3.01 slow, Eastern.]

J ...	......	......	......	......	......	......	......	58	1	46.9	21.7	......	......	......	......	...	...	...	...
F ...	......	......	......	......	......	......	......	67	22	56.0	29.2	......	......	......	......	...	...	...	...
M .	......	......	......	......	......	......	......	75	24	66.4	30.7	......	......	......	......	...	...	...	...
A ...	......	......	......	......	......	......	......	76	30	64.4	42.0	......	......	......	......	...	...	...	...
M .	......	......	......	......	......	......	......	...	...	......	......	......	......	......	......	...	...	...	...
J ...	......	......	......	51.0	72.8	61.5	61.0	97	33	78.5	42.0	......	......	......	......	...	...	...	...
J ...	......	......	......	49.8	86.2	71.4	69.1	104	38	91.6	48.3	......	......	......	......	...	...	...	...
A ...	......	......	......	......	......	......	......	...	...	......	......	......	......	......	......	...	...	...	...
S ...	25.418	25.61	25.18	39.5	72.7	57.8	56.7	91	28	79.0	37.7	......	......	......	......	...	...	...	...
O ..	25.461	25.71	25.25	36.6	68.5	52.4	52.5	90	23	73.8	33.5	......	......	......	......	...	...	...	...
N ..	25.321	25.78	24.94	34.7	42.6	38.4	38.6	64	20	46.4	31.8	30.4	35.8	33.7	33.3	85	79	84	82
D ..	25.471	25.77	25.15	31.2	39.5	35.5	35.4	54	13	43.6	28.6	27.8	33.9	30.9	30.9	87	80	83	84
Y ..	......	......	......	......	......	......	......	..	...	......	......	......	......	......	......	...	...	...	...

BISMARCK, DAK.

[Latitude, 46° 47′ N.; longitude, 100° 38′ W. Local time, 1.42 slow, Eastern.]

J ..	28.216	28.78	27.61	- 3.1	4.5	- 0.7	0.2	39	-36	9.4	-10.9	- 5.1	0.3	- 4.1	- 3.0	92	83	86	87
F ..	28.173	28.62	27.66	- 1.5	8.1	4.2	3.6	48	-28	14.0	- 6.6	- 4.7	4.0	2.2	0.5	87	85	92	88
M .	28.244	28.66	27.79	22.2	30.0	25.0	25.7	49	- 9	35.2	16.9	18.9	23.5	21.8	21.2	87	77	86	83
A ..	28.124	28.69	27.59	35.3	50.8	42.2	42.8	72	19	54.1	33.3	32.1	35.6	35.0	34.2	88	60	77	75
M .	28.112	28.46	27.75	45.3	63.1	53.6	54.0	83	22	66.7	43.1	41.5	47.0	45.9	45.1	87	60	76	74
J ..	28.156	28.57	27.39	54.5	70.4	61.3	62.1	87	34	74.0	50.8	49.9	51.8	54.5	52.1	85	54	79	72
J ..	28.116	28.41	27.67	60.9	77.1	67.9	68.6	97	44	80.6	58.9	54.6	56.2	56.8	55.9	80	50	69	66
A ..	28.109	28.53	27.86	53.8	72.3	60.8	62.3	92	39	74.7	52.3	49.2	50.4	51.4	50.3	85	49	72	69
S ..	28.128	28.51	27.68	45.9	69.1	56.3	57.1	95	32	71.4	44.4	39.6	43.7	43.1	42.1	79	44	64	62
O ..	28.180	28.47	27.68	33.6	53.9	41.6	43.0	80	16	56.7	31.3	26.3	28.1	28.2	27.5	75	41	61	59
N ..	28.133	28.46	27.75	27.0	35.3	30.0	30.8	51	10	39.1	24.4	23.6	28.1	25.5	25.7	86	76	83	82
D ..	28.152	28.58	27.63	18.7	28.2	22.6	23.2	53	-11	34.7	13.5	11.4	17.1	13.5	14.0	74	64	71	70
Y ..	28.161	28.78	27.39	32.7	46.9	38.7	39.4	97	-36	50.9	29.3	28.1	32.2	31.1	30.5	84	62	76	74

BLOCK ISLAND, R. I.

[Latitude, 41° 10′ N.; longitude, 71° 36′ W. Local time, 0.14 fast, Eastern.]

J ..	30.039	30.78	29.32	30.5	33.0	31.0	31.5	59	6	40.8	23.3	25.7	27.3	26.1	26	83	80	82	82
F ..	29.911	30.41	29.03	22.1	26.9	23.7	24.2	53	7	31.9	18.1	16.2	21.5	19.0	19	78	80	82	80
M .	29.980	30.50	29.47	27.1	33.4	28.9	29.8	53	9	37.1	23.0	21.2	27.4	23.4	24	78	78	80	78
A ..	29.973	30.52	29.21	41.8	48.7	43.2	44.6	70	27	53.1	38.5	35.9	39.2	37.3	38	80	71	80	77
M .	29.953	30.28	29.47	49.8	53.5	48.9	50.7	76	38	56.5	45.5	45.8	47.0	45.8	46	87	80	89	85
J ..	29.954	30.28	29.41	61.2	67.2	59.7	62.7	77	48	69.6	56.3	56.2	58.7	55.2	57	84	75	85	82
J ..	29.939	30.20	29.66	68.5	75.4	68.0	70.6	88	55	77.0	64.3	64.5	66.4	64.7	65	87	74	89	84
A ..	29.949	30.24	29.67	67.1	72.0	66.9	68.7	82	53	73.8	63.3	62.3	63.8	63.1	63	85	76	88	83
S ..	30.024	30.38	29.26	59.8	64.7	59.8	61.4	78	43	67.3	55.8	54.7	56.1	54.9	55	83	74	84	80
O ..	30.003	30.30	29.25	53.2	57.2	53.1	54.5	69	35	59.6	49.1	49.4	50.9	48.9	50	87	80	86	84
N ..	29.886	30.31	29.48	46.0	48.4	47.0	47.1	64	31	51.9	42.9	41.9	43.1	42.8	43	86	82	86	85
D ..	29.929	30.69	29.11	35.5	38.1	36.6	36.7	57	17	43.4	30.8	30.3	32.2	31.3	31	81	79	81	80
Y ..	29.962	30.78	29.03	46.9	51.5	47.2	48.5	88	6	55.2	42.6	42.0	44.5	42.7	43	83	77	84	82

Monthly and yearly meteorological summaries—Continued.

BENTON, FORT, MONT.
[H=2,681. h=49.]

Cloudiness (in tenths). 7 a.m.	3 p.m.	11 p.m.	Mean.	Wind. Total (miles).	Maximum.	Direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Precipitation. Total.	Max. 24 hours.	Number of days— Clear.	Fair.	Cloudy.	Rain or snow.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder-storms.	Auroras.	Months and year.
																In.	In.										
6.4	5.7	6.9	6.3	5,188	37	SW.	0	15	1	0	0	32	4	5	36	0.94	0.53	4	12	15	11	16	28	0	0	0	J.
6.5	6.0	5.5	6.0	5,134	40	W.	0	19	0	0	0	33	5	8	24	0.60	0.13	4	12	12	12	13	21	0	0	2	F.
4.3	3.8	3.8	3.8	5,748	38	SW.	2	14	1	0	0	35	15	8	18	0.40	0.18	16	9	6	7	0	20	0	0	0	M.
4.4	5.3	3.9	4.5	4,878	40	NW.	6	16	10	8	0	16	14	8	12	0.04	0.29	11	12	7	6	0	9	0	0	0	A.
4.4	5.8	4.9	5.0	5,117	43	NE.	1	13	8	10	3	26	14	9	11	0.48	0.19	6	20	4	7	0	3	0	0	1	M.
4.7	5.3	5.7	5.2	4,027	36	SW.	1	25	6	18	1	13	11	7	13	5.60	2.26	5	20	5	14	0	0	3	3	0	J.
4.4	4.4	4.7	4.5	4,178	40	SW.	3	16	3	5	1	24	17	8	16	2.82	0.60	11	13	7	13	0	0	5	0	0	J.
3.7	3.7	3.0	3.5	4,416	29	NE.	0	21	7	2	4	30	14	10	5	1.81	0.66	15	10	6	7	[illegible]	0	7	5	0	A.
4.7	4.2	4.2	4.4	5,300	42	W.	2	16	4	2	2	28	25	5	6	0.25	0.08	9	17	4	5	0	0	3	1	1	S.
3.3	4.5	3.6	4.0	3,659	33	W.	2	10	8	1	8	29	27	4	14	0.37	0.22	10	8	7	5	0	11	0	0	0	O.
5.4	5.3	5.0	5.2	2,692	32	W.	0	5	0	0	1	30	24	3	27	0.65	0.61	8	12	10	3	0	21	0	0	0	N.
7.7	6.8	6.5	7.0	3,011	57	SW.	0	3	0	0	0	28	17	7	38	0.38	0.12	2	13	16	6	4	23	0	0	1	D.
5.0	5.1	4.8	5.0	53,297	...	......	17	173	36	41	15	324	187	77	220	14.94	2.26	107	156	99	96	33	137	18	16	5	Y.

BIDWELL, FORT, CAL.
[H=4,640. h=4]

7 a.m.	3 p.m.	11 p.m.	Mean.	Total (miles).	Maximum.	Direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Total.	Max. 24 hours.	Clear.	Fair.	Cloudy.	Rain or snow.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder-storms.	Auroras.	Months and year.
...	...	...	...	......	...	......	...	...	...	...	...	...	...	...	...	2.00	...	...	...	...	...	...	...	...	...	...	J.
...	...	...	...	......	...	......	...	...	...	...	...	...	...	...	...	1.82	...	...	...	...	...	...	...	...	...	...	F.
...	...	...	...	......	...	......	...	...	...	...	...	...	...	...	...	0.04	...	...	...	...	...	...	...	...	...	...	M.
...	...	...	...	......	...	......	...	...	...	...	...	...	...	...	...	3.45	...	...	...	...	...	...	...	...	...	...	A.
...	...	...	...	2,298	24	SW.	10	2	0	4	12	13	11	3	3	1.90	0.71	11	6	6	10	...	...	...	0	0	M.
...	...	...	...	1,135	16	NW.	0	2	0	1	2	1	3	30	2	2.72	1.76	7	2	5	5	0	0	3	0	0	J.
[illegible]	2.1	1.8	1.5	3,813	20	[illegible]	29	4	1	5	33	9	4	6	9	0.38	0.23	24	6	1	6	0	0	20	0	0	J.
...	...	...	...	......	...	......	...	...	...	...	...	...	...	...	...	......	...	...	...	...	...	...	...	...	...	...	A.
2.0	2.6	1.8	2.1	2,250	15	NW.	5	4	2	3	5	7	16	8	10	0.09	0.09	13	6	0	2	0	1	1	0	0	S.
2.3	3.7	2.9	2.8	2,676	20	{SW.. / NW.}	6	6	6	6	10	7	26	16	8	0.75	0.41	13	15	3	6	0	16	1	2	0	O.
8.1	9.0	7.0	8.0	3,574	24	S.	2	1	1	1	42	6	18	9	8	8.40	1.28	1	8	21	24	0	13	0	0	0	N.
4.8	5.5	4.3	4.9	3,363	27	W.	2	3	1	4	26	3	32	6	16	3.74	1.05	9	13	9	11	2	21	0	0	0	D.
...	...	...	...	......	...	......	...	...	...	...	...	...	...	...	...	......	...	...	...	...	...	...	...	...	...	...	Y.

BISMARCK, DAK.
[H=1,694. h=31.]

BLOCK ISLAND, R. I.
[H=27. h=23.]

Monthly and yearly meteorological summaries—Continued.

BOISÉ CITY, IDAHO.

[Latitude, 43° 37′ N.; longitude, 116° 8′ W. Local time, 2.44 slow, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a. m.	Temperature. 3 p. m.	Temperature. 11 p. m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew point. 7 a. m.	Dew point. 3 p. m.	Dew point. 11 p. m.	Dew point. Mean.	Relative humidity. 7 a. m.	Relative humidity. 3 p. m.	Relative humidity. 11 p. m.	Relative humidity. Mean.
	In.	In.	In.	°	°	°	°	°	°	°	°	°	°	°	°				
J ..	27.343	27.62	26.92	19.1	28.8	24.7	24.0	50	− 7	33.8	15.8	16.7	21.2	20.8	19.2	87	[illegible]	85	82
F ..	27.247	27.65	26.91	34.8	41.6	38.7	38.4	59	13	46.0	32.6	31.4	32.4	33.4	32.4	87	70	82	80
M .	27.312	27.60	27.06	36.0	54.0	48.1	46.0	68	26	58.6	34.6	30.4	31.9	34.7	32.3	80	44	61	62
A ..	27.004	27.39	26.78	42.6	60.8	54.7	52.7	74	26	65.2	40.9	33.6	35.7	38.6	[illegible]	72	40	56	56
M .	27.106	27.34	26.70	49.7	67.0	60.1	55.9	87	37	70.9	48.2	43.3	44.6	47.0	45.0	79	40	64	63
J ..	27.099	27.35	26.79	54.2	72.7	66.9	64.3	99	41	77.0	53.1	47.8	50.8	51.9	50.2	79	48	62	63
J ..	27.124	27.31	26.87	60.8	84.2	76.6	73.9	98	51	88.1	59.7	49.9	51.1	52.8	51.3	69	33	44	48
A ..	27.141	27.35	26.90	59.0	81.3	74.1	71.6	96	50	85.9	57.6	46.6	40.0	53.1	49.6	64	33	49	49
S ..	27.135	27.42	26.74	51.5	71.4	62.5	61.8	90	42	75.6	49.8	42.8	44.0	47.3	44.6	72	40	59	57
O ..	27.230	27.44	26.93	43.4	61.4	52.9	52.6	79	32	66.8	41.2	36.3	38.9	40.3	38.6	76	44	63	61
N ..	27.137	27.68	26.71	42.1	49.3	45.9	45.6	62	30	52.4	38.9	36.4	37.5	39.1	37.7	81	65	78	75
D ..	27.307	27.67	26.94	31.8	39.9	34.2	35.3	60	6	48.7	27.7	29.6	33.2	31.1	31.2	92	78	89	86
Y ..	27.189	27.68	26.70	42.9	59.3	53.2	52.1	99	− 7	63.6	41.7	37.0	39.2	40.8	39.0	78	51	66	65

BOSTON, MASS.

[Latitude, 42° 21′ N.; longitude, 71° 4′ W. Local time, 0.16 fast, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a. m.	Temperature. 3 p. m.	Temperature. 11 p. m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew point. 7 a. m.	Dew point. 3 p. m.	Dew point. 11 p. m.	Dew point. Mean.	Relative humidity. 7 a. m.	Relative humidity. 3 p. m.	Relative humidity. 11 p. m.	Relative humidity. Mean.
J ..	29.891	30.66	29.08	22.8	31.1	26.0													
F ..	29.779	30.27	28.97	16.3	24.6	20.4													
M ..	29.841	30.36	29.26	22.8	34.0	26.8													
A ..	29.841	30.42	29.07	43.1	51.7	44.1													
M ..	29.856	30.20	29.40	50.5	56.6	50.7													
J ..	29.810	30.13	29.30	63.2	73.6	63.6													
J ..	29.816	30.10	29.48	69.2	76.1	68.7													
A ..	29.832	30.18	29.48	64.4	72.6	65.2													
S ..	29.859	30.26	29.05	56.7	65.7	57.3													
O ..	29.894	30.22	29.08	47.8	56.1	49.4													
N ..	29.704	30.27	29.34	41.2	47.3	42.8													
D ..	29.806	30.56	28.95	30.3	36.2	31.8													
Y ..	29.834	30.66	28.87	44.0	52.1	45.6													

BRIDGER, FORT, WYO.

[Latitude, 41° 20′ N.; longitude 110° 30′ W. Local time, 2.22 slow, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a. m.	Temperature. 3 p. m.	Temperature. 11 p. m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew point. 7 a. m.	Dew point. 3 p. m.	Dew point. 11 p. m.	Dew point. Mean.	Relative humidity. 7 a. m.	Relative humidity. 3 p. m.	Relative humidity. 11 p. m.	Relative humidity. Mean.
J ..	......	......	......	......	......	......	......	48	−18	[illegible]	10.6	......	......	......	......	......	......	......	......
F ..	......	......	......	......	......	......	......	46	4	34.4	18.5	......	......	......	......	......	......	......	......
M ..	......	......	......	......	......	......	......	60	10	44.4	20.7	......	......	......	......	......	......	......	......
A ..	......	......	......	......	......	......	......	63	21	53.6	31.0	......	......	......	......	......	......	......	......
M ..	......	......	......	......	......	......	......	79	23	60.7	32.6	......	......	......	......	......	......	......	......
J ..	......	......	......	......	......	......	......	80	23	68.9	37.6	......	......	......	......	......	......	......	......
J ..	......	......	......	......	......	......	......	86	37	78.2	45.6	......	......	......	......	......	......	......	......
A ..	23.681	23.77	23.44	46.2	71.0	57.0	58.7	86	33	74.9	45.5	39.7	43.6	43.6	42.3	74	42	63	60
S ..	23.564	23.78	23.23	41.8	64.0	49.6	51.8	79	31	68.6	38.4	32.2	35.6	35.6	34.5	72	38	61	57
O ..	23.598	23.76	23.35	33.9	57.5	40.9	44.1	76	16	61.1	29.8	25.2	26.8	24.6	25.6	72	39	54	53
N ..	23.468	23.75	22.92	23.9	42.0	30.4	32.1	62	8	47.2	19.6	19.3	26.7	24.3	23.4	92	58	77	73
D ..	23.606	23.79	23.06	22.5	30.9	22.6	25.4	48	− 3	34.8	14.6	16.5	21.0	18.9	18.8	80	68	85	78
Y ..	......	......	......	......	......	......	......	86	−13	54.7	28.7	......	......	......	......	......	......	......	......

BROWNSVILLE, TEX.

[Latitude, 25° 53′ N.; longitude, 97° 26′ W. Local time, 1.30 slow, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a. m.	Temperature. 3 p. m.	Temperature. 11 p. m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew point. 7 a. m.	Dew point. 3 p. m.	Dew point. 11 p. m.	Dew point. Mean.	Relative humidity. 7 a. m.	Relative humidity. 3 p. m.	Relative humidity. 11 p. m.	Relative humidity. Mean.
J ..	30.093	30.65	29.78	46.8	58.9	51.6	52.4	77	27	62.1	46.5	44.2	46.5	46.0	46.9	91	71	88	83
F ..	29.978	30.31	29.64	52.4	63.3	55.5	57.1	82	35	67.3	49.4	49.7	51.7	51.5	51.1	91	69	88	83
M ..	30.047	30.38	29.76	62.4	71.2	64.1	65.9	84	46	74.0	60.5	60.2	62.8	61.7	61.6	92	78	92	87
A ..	29.888	30.10	29.67	70.1	81.2	72.6	74.6	91	59	83.9	66.0	68.2	68.6	69.9	69.1	96	65	91	84
M ..	29.832	29.99	29.61	73.0	82.3	75.2	76.8	95	63	86.5	71.2	71.7	72.2	72.6	72.2	96	72	92	87
J ..	29.933	30.05	29.74	76.4	88.3	79.1	81.3	94	68	91.9	75.5	73.8	71.4	74.2	73.1	92	56	86	78
J ..	29.954	30.09	29.83	77.7	89.7	80.4	82.6	94	71	91.9	76.9	75.6	70.8	75.2	73.9	94	54	84	78
A ..	29.910	30.01	29.82	78.2	87.7	79.1	81.0	96	71	91.6	75.5	74.7	72.2	75.4	74.1	96	62	89	82
S ..	29.871	29.96	29.75	74.8	85.5	77.5	79.3	93	68	89.2	74.1	73.6	72.2	74.7	73.6	97	66	92	85
O ..	29.971	30.23	29.75	66.3	79.6	69.7	71.9	92	56	82.4	65.3	63.8	64.0	65.8	64.5	92	60	88	80
N ..	29.993	30.27	29.56	61.3	76.9	65.2	67.8	88	41	78.6	59.1	58.6	60.5	61.1	60.1	94	58	89	79
D ..	30.009	30.48	29.43	56.1	71.5	60.1	62.6	93	33	73.4	53.2	51.6	52.7	55.5	53.3	87	54	86	76
Y ..	29.964	30.65	29.43	66.1	78.0	69.2	71.1	95	27	81.1	64.6	63.9	64.0	65.5	64.5	93	64	89	82

Monthly and yearly meteorological summaries—Continued.

BOISÉ CITY, IDAHO.

[H = 2,750. h = 32.]

BOSTON, MASS.

[H = 125. h = 174.]

5.3	5.4	4.9	5.2	10,709	42	S.	6	4	2	1	9	22	37	10	0	5.33	1.89	9	12	10	9	11	26	0	0	0	J.
4.6	4.8	3.8	4.4	9,244	54	E.	7	7	6	3	1	5	35	18	1	3.00	1.74	12	10	6	10	19	28	0	0	0	F.
4.8	5.1	4.1	4.7	10,277	39	W.	13	9	2	0	12	8	42	13	0	1.15	0.41	8	18	7	9	11	28	0	0	0	M.
3.4	4.0	4.7	4.0	9,323	50	N.	12	6	12	2	7	9	23	17	1	3.30	1.26	15	7	7	10	0	4	0	0	0	A.
5.1	6.0	4.4	5.2	7,811	44	N.	10	11	28	7	4	11	15	7	0	4.20	0.99	11	10	10	12	0	0	0	0	0	M.
3.5	5.3	2.5	3.8	8,039	34	E.	9	1	3	8	5	26	28	14	1	3.70	1.67	15	11	4	7	0	0	1	2	0	J.
4.1	4.6	2.8	3.8	5,911	24	SW.	10	8	18	6	8	16	17	11	7	1.44	0.43	13	15	8	8	0	0	4	3	0	J.
5.3	4.8	5.1	5.1	7,431	38	S.	12	4	11	11	3	20	15	17	0	7.64	2.53	3	21	7	12	0	0	0	4	0	A.
2.9	3.9	2.9	3.2	6,977	37	NW.	13	4	7	5	4	13	33	10	1	1.70	0.88	14	12	4	7	0	0	0	0	0	S.
3.2	5.1	3.6	4.0	7,395	40	E.	11	6	16	8	9	11	20	10	2	5.71	1.01	11	12	5	9	0	0	0	0	0	O.
5.1	6.8	5.7	5.9	9,332	46	NE.	15	12	7	3	1	14	27	11	0	6.78	1.96	9	8	13	12	0	8	0	0	1	N.
6.8	5.6	5.5	5.6	10,850	48	W.	20	2	1	1	7	13	29	20	0	2.00	0.47	8	11	12	14	7	26	3	0	1	D.
4.4	5.1	4.2	4.6	104,205	..	......	140	63	109	50	70	170	322	158	13	45.10	2.53	131	145	88	119	48	120	5	9	2	Y.

BRIDGER, FORT, WYO.

[H = 6,643. h = 1.]

...	...	...	...	....	..	....	...	...	...	...	...	..	...	...	...	0.08	....	...	...	..	8	..	..	..	..	J.
...	...	...	...	....	..	....	...	...	...	...	...	..	...	...	...	0.40	....	...	..	..	11	..	...	..	..	F.
...	...	...	...	....	..	....	..	...	..	...	..	...	...	..	...	0.27	...	...	..	..	4	..	..	..	..	M.
..	...	...	...	....	..	....	..	...	..	...	..	..	..	...	..	1.49	...	..	..	..	17	..	...	..	..	A.
...	...	...	...	....	..	....	...	...	...	..	..	..	..	...	..	1.66	...	...	..	..	22	.	.	..	..	M.
..	...	...	..	......	..	....	..	..	.	...	..	..	..	..	..	0.70	....	..	...	..	12	..	...	..	.	J.
..	...	.	.	....	.	...	...	..	..	...	..	...	...	...	...	0.53	...	...	..	..	10	.	....	..	..	J.
2.4	5.7	2.6	4.0	8,433	32	SW.	3	2	6	2	13	37	10	5	15	1.46	0.51	18	13	5	10	0	0	0	2	0	A.
2.1	4.6	1.9	2.9	5,282	30	SW.	0	11	[illegible]	0	8	[illegible]	16	4	2	0.09	0.45	19	7	4	5	0	2	0	2	0	S.
2.4	3.5	1.4	2.4	5,625	41	SW.	3	5	1	0	0	52	15	8	0	0.38	0.18	20	10	1	3	0	18	0	1	0	O.
3.0	6.6	3.0	4.2	2,940	36	SW.	1	6	5	2	1	25	19	1	2	0.43	0.29	10	6	4	3	2	20	0	0	0	N.
3.0	5.0	3.5	3.8	6,047	44	W.	4	2	1	4	7	36	21	5	2	0.41	0.22	12	10	6	7	10	26	0	0	0	D.
...	..	..	...	....	..	....	.	..	...	...	...	..	...	..	..	8.80	..	...	...	..	...	..	..	..	..	Y.

BROWNSVILLE, TEX.

[H = 67. h = 34.]

5.3	6.8	5.7	5.9	6,318	26	N.	28	3	7	5	10	2	6	22	10	3.87	1.39	5	15	11	17	0	2	0	0	0	J.
6.8	4.8	5.0	6.0	5,741	29	N.	33	5	2	4	25	1	2	7	5	2.62	1.13	7	9	12	11	0	0	0	1	0	F.
7.9	8.2	6.7	7.6	5,976	28	S.	25	18	10	10	16	1	0	1	3	1.54	0.37	1	12	18	13	0	0	0	0	0	M.
6.2	6.1	6.4	6.2	6,686	38	NW.	7	13	11	19	32	2	2	1	3	0.67	0.29	4	15	11	7	0	0	1	2	0	A.
6.7	7.5	5.6	6.6	5,526	30	N.	13	14	19	22	8	3	2	0	12	7.17	2.80	3	15	13	11	0	0	7	8	0	M.
2.3	5.4	0.9	2.9	5,306	22	S., SE.	1	0	20	29	33	0	0	0	7	0.51	0.48	23	5	2	3	0	0	27	1	0	J.
2.6	5.6	1.7	2.3	6,237	28	S., SW.	0	0	7	27	40	3	1	0	6	0.22	0.17	17	12	2	2	0	0	28	4	0	J.
3.2	6.8	2.1	4.0	4,556	24	S.	2	4	18	21	22	4	3	0	10	2.06	0.59	14	14	3	10	0	0	21	18	0	A.
6.1	6.5	3.3	5.3	4,690	22	S.	11	14	10	14	17	1	0	11	12	3.53	0.99	8	13	9	12	0	0	12	5	0	S.
5.1	6.3	3.9	5.1	4,406	20	SE., N., S.	17	18	9	11	13	8	3	4	10	8.29	4.31	12	8	11	6	0	0	2	1	0	O.
3.2	5.7	3.0	4.3	4,975	30	N.	22	5	16	6	30	1	1	2	7	0.20	0.10	9	14	7	3	0	0	0	1	0	N.
2.5	5.6	3.3	4.1	6,827	30	S.	19	13	10	14	27	1	1	3	7	1.20	0.87	12	13	6	4	0	0	1	0	0	D.
4.9	6.4	4.0	5.1	65,304		....	176	107	148	182	280	27	21	50	101	31.83	4.31	115	145	105	99	0	2	90	36	0	Y.

Monthly and yearly meteorological summaries—Continued.

BUFFALO, N. Y.

[Latitude, 42° 53′ N.; longitude, 78° 53′ W. Local time, 0.15 slow, Eastern.]

Months and year.	Pressure.			Temperature.						Mean.		Dew point.				Relative humidity.			
	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.
	In.	In.	In.	°	°	°	°	°	°	°	°	°	°	°	°				
J ..	29.285	29.99	28.46	19.1	21.8	20.2	20.4	50	-5	27.9	14.0	16.5	18.0	16.7	17.1	90	85	86	87
F ..	29.210	29.75	28.85	10.1	17.1	14.1	13.8	43	-13	23.6	5.6	6.9	12.3	10.8	10.0	86	81	86	84
M .	29.265	29.66	28.64	10.6	22.7	19.9	19.7	45	-4	28.1	12.7	12.0	17.8	15.5	15.1	82	81	82	82
A ..	29.286	29.74	28.76	37.6	43.5	38.5	39.9	82	20	48.7	32.7	31.9	34.5	31.5	32.6	80	73	77	77
M .	29.200	29.48	28.77	50.7	56.7	52.0	53.1	81	30	61.7	46.0	45.6	48.5	47.1	47.1	84	76	84	81
J ..	29.265	29.55	28.86	58.3	64.0	60.3	60.9	80	44	68.0	53.7	53.4	56.2	55.2	54.9	84	77	84	82
J ..	29.231	29.46	28.96	66.4	73.8	68.4	69.5	87	48	77.5	62.5	61.6	65.7	64.2	63.8	85	77	87	83
A ..	29.233	29.53	28.74	61.6	69.3	63.2	64.7	83	49	71.7	58.2	58.7	61.1	59.1	59.6	90	76	87	84
S ..	29.307	29.60	28.81	56.1	65.4	58.5	60.0	83	41	68.0	52.3	51.1	53.9	53.0	52.7	84	68	82	78
O ..	29.242	29.60	28.71	46.3	53.8	47.5	49.2	80	29	56.8	43.3	41.9	44.9	43.4	43.4	85	73	86	81
N ..	29.176	29.60	28.82	39.0	42.4	40.0	40.5	68	28	46.0	36.2	35.1	36.5	35.4	35.7	86	80	84	83
D ..	29.221	29.94	28.38	28.7	31.7	29.7	30.0	62	5	37.8	24.4	25.5	27.1	25.8	26.1	88	83	85	85
Y ..	29.243	29.99	28.35	40.9	46.8	42.7	43.5	87	-13	51.3	36.8	36.7	39.7	38.1	38.2	85	78	84	82

BUFORD, FORT, DAK.

[Latitude, 48° N.; longitude, 103° 56′ W. Local time, 1.56 slow, Eastern.]

J ..	27.979	28.54	27.37	-5.2	4.5	0.7	0.0	45	-46	11.3	-13.1	-10.8	-2.8	-5.3	-6.3	75	71	75	74
F ..	27.947	28.42	27.40	0.1	10.2	3.4	4.6	46	-32	15.2	-6.0	-5.2	2.0	-2.5	-1.9	78	71	76	75
M .	28.023	28.41	27.63	24.1	33.3	28.6	28.7	58	3	39.1	19.9	19.8	23.7	23.2	22.2	83	68	80	77
A ..	27.909	28.28	27.88	35.3	53.1	42.1	43.5	75	19	57.7	32.8	29.6	32.0	33.0	31.5	81	49	72	67
M .	27.884	28.27	27.57	44.0	65.1	53.4	54.2	84	20	70.2	41.6	37.9	37.6	37.9	37.8	80	39	58	59
J ..	27.924	28.34	27.16	53.9	71.2	60.4	61.8	91	36	76.5	50.5	50.5	52.8	51.8	51.7	89	54	75	72
J ..	27.887	28.18	27.43	58.7	77.8	66.9	67.8	96	46	82.8	57.4	54.1	55.7	56.0	55.3	85	49	70	68
A ..	27.984	28.27	27.64	53.2	72.2	60.3	61.9	90	40	76.1	51.3	49.1	51.7	50.9	50.6	87	50	73	70
S ..	27.897	28.27	27.43	43.7	68.2	54.5	55.5	90	30	72.0	41.5	37.8	41.3	40.8	40.0	81	41	62	61
O ..	27.959	28.26	27.48	32.4	54.8	41.8	43.0	78	15	57.8	29.4	27.1	31.6	30.3	29.7	81	44	66	64
N ..	27.877	28.22	27.50	29.3	39.7	32.9	34.0	58	12	42.4	26.4	27.7	32.5	29.6	29.9	93	77	88	86
D ..	27.915	28.34	27.42	19.9	29.7	21.9	23.8	59	-10	33.6	14.4	17.8	22.7	18.9	19.8	92	77	88	86
Y ..	27.932	28.54	27.16	32.4	48.3	38.9	39.9	96	-46	52.9	28.8	28.0	31.7	30.4	30.3	84	57	74	72

CAIRO, ILL.

[Latitude, 37° 0′ N.; longitude, 89° 10′ W. Local time, 0.50 slow, Eastern.]

J ..	29.818	30.33	29.02	25.9	33.3	30.3	29.8	61	-4	37.9	22.1	20.7	24.2	23.4	22.8	80	71	76	76
F ..	29.681	30.11	29.17	27.0	36.4	32.2	31.9	67	1	40.5	23.6	18.9	23.9	21.9	21.6	72	61	66	66
M .	29.757	30.16	29.39	36.7	48.3	42.6	42.5	75	16	51.3	34.9	29.6	32.2	31.3	31.0	75	56	65	65
A ..	29.644	30.02	29.18	53.7	66.2	59.3	59.7	81	34	69.5	51.6	44.2	46.5	46.3	45.7	71	51	63	62
M .	29.578	29.80	29.18	60.7	71.9	64.1	65.6	89	40	74.1	58.3	53.8	52.2	54.5	53.5	79	52	72	68
J ..	29.683	29.86	29.43	69.6	81.0	73.0	74.5	92	53	82.4	66.6	63.6	66.4	65.9	65.3	82	62	79	74
J ..	29.636	29.80	29.50	75.0	80.5	78.5	80.0	96	62	87.6	72.9	70.0	70.1	72.0	70.7	85	59	81	75
A ..	29.616	29.81	29.32	70.8	83.6	75.2	76.5	95	54	84.6	69.4	65.5	67.3	67.6	66.8	84	59	78	73
S ..	29.656	29.88	29.35	64.0	75.4	68.6	69.3	85	51	76.5	62.8	59.5	61.4	62.4	61.1	86	64	81	77
O ..	29.630	29.97	29.27	49.8	63.4	54.5	55.9	78	39	64.5	48.6	45.8	45.6	48.0	46.5	86	54	79	73
N ..	29.649	29.93	29.21	43.4	54.8	47.8	48.7	76	28	55.6	40.1	36.5	36.8	38.0	37.1	78	54	71	67
D ..	29.765	30.24	29.02	34.1	44.2	38.7	39.0	63	14	46.6	30.4	26.7	27.9	27.8	27.5	76	55	66	66
Y ..	29.676	30.33	29.02	50.9	62.1	55.4	56.1	96	-4	64.3	48.4	44.6	46.2	46.6	45.8	79	58	73	70

CANBY, FORT, WASH.

[Latitude, 46° 16′ N.; longitude, 124° 4′ W. Local time, 3.16 slow, Eastern.]

J ..	29.879	30.18	29.33	39.9	42.9	42.2	41.7	53	31	45.5	38.1	36.8	39.6	39.0	38.5	89	89	89	89
F ..	29.891	30.32	29.51	44.7	46.8	45.5	45.7	58	35	49.1	41.8	42.6	44.0	43.2	43.3	93	91	92	92
M .	29.989	30.42	29.66	47.6	51.2	49.7	49.5	68	38	54.8	44.7	43.8	45.7	44.5	44.7	88	83	84	85
A ..	29.877	30.16	29.55	46.4	51.8	48.4	48.9	70	37	54.0	44.5	43.1	45.0	44.2	44.1	89	80	86	85
M .	29.799	30.03	29.53	50.4	54.8	52.6	52.6	75	44	57.8	48.5	47.5	50.3	48.4	48.7	90	85	86	87
J ..	29.853	30.07	29.54	53.5	58.3	55.7	55.8	66	46	60.1	51.7	51.3	52.8	51.5	51.9	92	82	86	87
J ..	29.840	30.06	29.60	57.8	63.1	60.4	60.4	75	51	65.7	55.9	54.0	56.5	54.3	54.9	88	79	81	83
A ..	29.819	29.99	29.59	55.9	60.2	57.4	57.8	70	50	62.6	53.8	53.5	56.2	54.3	54.7	92	87	89	90
S ..	29.749	29.99	29.49	56.8	60.6	58.2	58.5	70	49	62.6	54.0	54.4	57.3	55.5	55.7	92	89	91	91
O ..	29.770	30.03	29.56	52.6	58.0	54.7	55.1	70	46	60.6	51.0	49.9	53.5	51.4	51.6	91	86	89	86
N ..	29.536	30.04	28.87	47.9	50.5	50.0	49.5	58	42	54.0	46.6	46.9	48.5	48.5	48.0	96	93	95	95
D ..	29.804	30.22	29.27	45.5	47.5	47.0	46.7	56	33	50.2	44.1	44.4	46.0	45.6	45.3	96	95	95	95
Y ..	29.817	30.42	28.87	49.9	53.8	51.8	51.8	75	31	56.4	47.9	47.4	49.6	48.4	48.5	91	87	89	89

Monthly and yearly meteorological summaries—Continued.

BUFFALO, N. Y.
[H=690. h=106]

Cloudiness (in tenths).				Wind.												Precipitation.		Number of days—									
7 a. m.	3 p. m.	11 p. m.	Mean.	Total (miles).	Maximum.	Direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Total.	Max. 24 hours.	Clear.	Fair.	Cloudy.	Rain or snow.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder-storms.	Auroras.	Months and year.
																In.	In.										
8.0	7.8	6.6	7.5	12,769	71	SW.	1	6	3	6	14	81	28	3	1	3.10	0.91	1	14	16	21	19	28	0	0	0	J.
6.1	6.7	6.3	6.4	7,772	56	SW.	1	11	10	3	9	87	9	3	1	1.57	0.76	5	10	13	15	19	26	0	0	0	F.
8.3	7.3	6.1	6.6	10,116	56	SW.	5	10	2	2	18	24	24	8	1	1.53	0.40	4	15	12	19	17	29	0	0	0	M.
5.6	5.7	5.0	5.5	7,423	44	SW.	6	12	11	4	15	81	10	3	0	3.47	1.71	8	10	12	18	1	19	0	2	0	A.
5.4	6.4	4.6	5.5	6,216	32	SW.	2	12	9	12	17	32	6	2	1	3.80	1.30	6	15	10	17	0	1	0	3	0	M.
4.6	4.5	3.9	4.3	7,320	42	SW.	3	3	2	5	19	41	10	7	0	6.39	3.28	13	9	8	14	0	0	0	4	0	J.
4.4	5.2	2.6	4.1	6,885	32	SW.	8	6	7	5	12	89	11	5	0	3.63	1.43	12	16	3	13	0	0	0	6	0	J.
7.3	6.9	5.0	6.4	6,242	43	SW.	13	13	10	4	14	18	14	7	0	10.63	2.66	4	16	11	17	0	0	0	8	0	A.
4.0	4.8	4.1	4.3	6,809	41	W.	3	11	10	5	14	24	15	8	0	4.69	1.57	10	14	6	11	0	0	0	4	1	S.
6.5	6.6	6.2	6.4	6,896	37	SW.	9	13	9	11	16	12	18	6	0	6.19	1.59	7	10	14	17	0	2	0	2	0	O.
8.2	8.9	7.9	8.3	8,632	43	SW.	7	12	3	7	18	12	28	3	0	2.66	0.73	0	8	22	20	0	12	0	0	0	N.
7.9	8.6	8.1	8.2	11,215	48	SW.	0	10	9	5	12	18	38	1	0	4.61	1.16	2	9	21	19	7	26	0	0	0	D.
6.2	6.6	5.8	6.1	97,749	...	....	58	119	85	69	176	323	211	50	4	52.36	3.28	72	145	148	196	83	145	0	29	1	Y.

BUFORD, FORT, DAK.
[H=1,930. h=1.]

CAIRO, ILL.
[H=359. h=73.]

CANBY, FORT, WASH.
[H=179. h=1.]

Monthly and yearly meteorological summaries—Continued.

CAPE HENRY, VA.

[Latitude, 36° 56′ N.; longitude, 76° 0′ W. Local time, 0.04 slow, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a. m.	Temperature. 3 p. m.	Temperature. 11 p. m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew point. 7 a. m.	Dew point. 3 p. m.	Dew point. 11 p. m.	Dew point. Mean.	Relative humidity. 7 a. m.	Relative humidity. 3 p. m.	Relative humidity. 11 p. m.	Relative humidity. Mean.
	In.	In.	In.	°	°	°	°	°	°	°	°	°	°	°	°				
J ..	30.167	30.79	29.51	40.1	44.2	41.7	42.0	74	15	51.8	32.9	33.2	33.0	33.1	33.1	77	67	73	72
F ..	29.982	30.60	29.21	32.9	37.6	35.6	35.5	66	14	42.5	28.1	28.6	27.6	27.6	27.3	73	68	70	72
M ..	30.061	30.61	29.60	36.1	42.8	38.2	39.4	66	21	48.0	32.6	28.8	32.1	31.0	30.7	76	65	77	73
A ..	30.050	30.56	29.58	50.4	58.9	52.8	54.0	76	35	62.6	44.8	41.1	45.6	43.7	44.1	76	68	73	71
M ..	29.983	30.30	29.41	58.6	66.8	60.7	62.1	84	47	70.1	56.8	56.3	57.5	56.1	56.3	80	74	86	82
J ..	30.034	30.30	29.60	69.4	78.8	69.2	72.2	94	57	80.5	65.6	62.8	63.7	63.3	63.3	80	62	82	73
J ..	29.978	30.20	29.72	74.4	85.0	75.7	78.4	98	60	87.6	71.1	69.0	71.2	69.5	69.9	81	65	82	77
A ..	29.975	30.24	29.06	72.8	82.6	75.0	77.1	95	60	84.8	71.4	68.2	68.8	68.2	68.4	83	65	86	78
S ..	30.064	30.34	29.52	65.7	76.2	68.2	70.4	88	53	77.6	62.8	60.7	62.6	61.8	61.7	82	64	80	75
O ..	29.991	30.34	29.26	58.6	65.2	59.5	61.1	82	45	68.2	55.5	52.4	54.0	52.3	52.9	81	68	76	76
N ..	29.975	30.58	29.56	47.9	55.5	50.4	51.2	78	34	58.2	44.5	41.4	42.9	42.9	42.4	76	64	76	72
D ..	30.068	30.74	29.33	41.6	46.4	42.7	43.4	67	22	51.4	34.4	34.6	37.6	34.4	35.3	77	72	76	74
Y ..	30.020	30.79	29.21	54.8	61.7	55.8	57.3	98	14	65.6	50.4	48.0	48.7	48.7	48.6	80	67	78	75

CAPE MAY, N. J.

[Latitude, 38° 56′ N.; longitude, 74° 56′ W. Local time, 0.02 slow, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a. m.	Temperature. 3 p. m.	Temperature. 11 p. m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew point. 7 a. m.	Dew point. 3 p. m.	Dew point. 11 p. m.	Dew point. Mean.	Relative humidity. 7 a. m.	Relative humidity. 3 p. m.	Relative humidity. 11 p. m.	Relative humidity. Mean.
J ..	30.007	30.79	29.27	34.9	38.0	35.4	36.4	57	13	44.9	28.4	28.7	32.8	30.8	30.4	78	78	86	78
F ..	29.960	30.45	29.21	27.6	31.1	30.2	29.8	53	4	36.5	22.8	21.1	24.8	24.5	22.8	77	78	78	78
M ..	30.025	30.45	29.60	30.7	36.5	32.8	34.3	52	11	38.7	28.0	24.2	22.4	26.9	28.5	77	79	82	80
A ..	30.007	30.54	29.44	46.5	53.7	47.5	48.9	62	21	55.3	41.8	39.6	43.3	42.6	42.5	80	74	84	79
M ..	29.916	30.17	29.51	55.5	60.6	56.0	57.4	77	42	62.7	52.0	51.2	54.0	52.4	52.5	85	78	86	84
J ..	29.963	30.24	29.46	64.9	71.0	65.0	67.6	85	50	74.7	61.6	59.4	62.0	60.4	60.5	83	74	88	82
J ..	29.934	30.13	29.67	72.0	78.8	72.2	74.1	88	61	80.8	68.5	68.4	70.2	68.0	68.2	86	77	88	83
A ..	29.987	30.21	29.61	71.5	78.1	71.7	73.8	88	54	79.8	67.8	66.0	67.8	66.5	66.7	82	72	84	79
S ..	30.034	30.32	29.39	63.9	71.4	65.4	66.8	83	52	72.6	60.2	57.6	60.9	57.8	58.8	80	71	78	76
O ..	30.003	30.32	29.12	56.7	61.2	56.8	56.2	76	38	65.0	52.1	48.8	52.1	48.6	48.9	78	76	79	78
N ..	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
D ..	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Y ..	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......

CAPE MENDOCINO, CAL.

[Latitude, 40° 26′ N.; longitude, 124° 24′ W. Local time, 3.16 slow, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a. m.	Temperature. 3 p. m.	Temperature. 11 p. m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew point. 7 a. m.	Dew point. 3 p. m.	Dew point. 11 p. m.	Dew point. Mean.	Relative humidity. 7 a. m.	Relative humidity. 3 p. m.	Relative humidity. 11 p. m.	Relative humidity. Mean.
J ..	29.415	29.71	28.10	47.0	51.9	50.2	49.7	60	38	54.1	45.8	42.8	44.0	43.8	42.7	84	78	88	81
F ..	29.463	29.76	28.81	44.5	51.1	49.9	48.2	60	40	53.6	45.4	42.9	46.4	44.9	44.4	85	86	88	86
M ..	29.426	29.75	28.18	44.8	52.4	50.4	48.9	70	41	55.0	45.8	42.5	47.2	45.5	45.1	87	82	84	84
A ..	29.323	29.48	28.90	47.6	54.7	50.6	50.8	69	39	56.7	46.1	43.3	48.6	45.9	45.8	86	82	84	84
M ..	29.319	29.51	28.16	47.9	55.1	51.6	51.5	66	42	57.7	46.8	43.9	48.6	47.2	46.9	87	82	86	86
J ..	29.370	29.52	29.19	50.4	56.9	53.9	53.7	70	44	59.7	48.0	47.3	52.0	50.2	49.8	90	84	87	87
J ..	29.315	29.52	29.16	52.7	59.6	56.0	56.7	72	46	63.2	50.6	50.6	52.4	51.4	51.5	90	78	86	84
A ..	29.275	29.40	29.12	50.2	56.1	54.4	53.6	66	45	60.7	48.0	48.6	51.7	50.8	50.4	95	86	88	88
S ..	29.296	29.42	29.14	54.1	60.4	58.3	57.6	77	46	63.4	51.8	48.7	53.7	52.7	51.7	83	79	86	81
O ..	29.317	29.56	29.06	53.9	60.6	58.1	57.3	80	47	64.9	51.8	50.1	52.8	49.3	50.7	87	77	79	81
N ..	29.205	29.56	28.70	50.8	55.0	52.8	52.7	67	44	58.2	48.1	46.8	50.2	48.8	48.5	88	85	88	88
D ..	29.399	29.65	28.91	48.0	53.1	51.8	51.0	62	39	55.6	48.1	44.9	48.9	48.2	47.2	88	88	88	88
Y ..	29.369	29.75	28.30	49.7	55.8	53.2	52.8	80	38	58.5	47.7	46.9	48.8	48.2	48.0	88	82	84	85

CEDAR KEYS, FLA.

[Latitude, 29° 8′ N.; longitude, 83° 2′ W. Local time, 0.32 slow, Eastern.]

Monthly and yearly meteorological summaries—Continued.

CAPE HENRY, VA.

[$H=16.$ $h=6.$]

Cloudiness (in tenths). 7 a.m.	3 p.m.	11 p.m.	Mean.	Wind. Total (miles).	Maximum.	Direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Precipitation. Total.	Max. 24 hours.	Number of days. Clear.	Fair.	Cloudy.	Rain or snow.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder-storms.	Auroras.	Months and year.
																In.	*In.*										
5.3	5.6	4.6	5.2	11,570	47	N.	16	11	8	2	17	17	11	[illegible]	8	3.86	0.69	9	12	10	14	0	11	0	0	0	J.
5.9	4.6	4.6	5.0	9,279	47	NW.	27	5	4	5	8	11	8	15	1	3.72	0.85	8	11	9	13	4	18	0	0	0	F.
4.6	5.4	5.4	5.1	10,287	40	NE.	21	15	4	4	18	12	7	10	2	2.61	0.51	10	20	11	14	2	13	0	1	0	M.
3.6	4.3	2.7	3.5	9,649	56	NW.	4	17	8	9	19	14	5	9	5	1.45	0.67	14	13	3	7	0	0	0	2	0	A.
5.2	5.6	5.0	5.3	8,632	41	NE.	11	22	13	12	11	6	4	9	3	4.98	1.57	8	14	9	18	0	0	0	2	0	M.
3.9	4.6	2.2	3.9	8,207	44	SW.	12	11	11	14	15	16	5	5	1	2.26	1.03	14	10	6	9	0	0	2	8	0	J.
3.3	3.6	2.6	3.1	7,242	32	NW.	3	13	11	10	16	28	3	7	2	2.89	0.99	17	12	2	10	0	0	12	6	0	J.
4.4	4.1	3.0	3.9	8,780	45	N.	10	17	11	10	18	19	4	2	2	2.87	0.75	12	16	3	7	0	0	6	0	0	A.
4.2	3.7	2.9	3.6	9,526	51	NW.	10	37	9	5	11	16	0	8	0	2.83	1.83	15	10	5	5	0	0	0	0	0	S.
4.3	4.9	2.5	3.9	10,139	52	E.	19	16	11	11	13	8	4	8	1	2.49	0.74	13	12	6	9	0	0	0	2	0	O.
5.8	5.8	4.5	5.4	10,521	44	N.	13	6	1	8	20	12	9	21	1	4.24	1.55	8	12	10	11	0	0	0	0	0	N.
4.3	4.5	2.7	3.8	12,078	53	N.	18	6	1	5	11	21	14	14	1	3.49	1.39	16	8	7	6	0	10	0	0	0	D.
4.6	4.7	3.6	4.3	15,919	...	......	164	179	87	95	177	181	74	116	22	36.55	1.57	144	140	81	123	6	52	20	17	0	Y.

CAPE MAY, N. J.

[$H=27.$ $h=6.$]

7 a.m.	3 p.m.	11 p.m.	Mean.	Total (miles).	Maximum.	Direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Total.	Max. 24 hours.	Clear.	Fair.	Cloudy.	Rain or snow.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder-storms.	Auroras.	Months and year.
5.2	5.8	4.4	5.1	12,456	62	NW.	12	10	8	3	10	5	16	22	0	4.98	1.24	6	21	4	12	8	17	0	..	0	J.
6.9	5.3	4.1	5.4	12,403	55	NW.	8	14	9	3	2	5	9	34	0	3.71	1.55	6	16	6	11	6	23	0	..	0	F.
5.2	5.8	5.3	5.5	12,470	54	NW.	12	13	4	8	17	12	6	20	0	2.29	0.66	4	19	8	14	3	18	0	..	0	M.
4.8	3.9	4.2	4.3	10,909	70	NW.	4	9	12	14	22	6	6	17	0	1.67	0.65	10	16	4	8	0	2	0	..	0	A.
5.1	6.4	5.0	5.5	9,106	82	NW.	6	10	25	17	10	5	6	14	0	5.20	2.07	6	18	7	14	0	0	0	..	0	M.
3.7	4.8	3.3	3.9	9,429	48	SW.	5	4	4	24	24	9	5	15	0	2.23	0.67	12	15	3	7	0	0	0	..	0	J.
4.4	4.9	2.1	3.8	7,482	40	E.	2	9	17	17	27	8	7	6	0	1.57	0.68	16	18	3	5	0	0	0	.	0	J.
4.9	5.3	2.4	4.5	9,450	40	SW.	7	8	10	21	21	11	7	8	0	3.47	1.03	12	13	6	8	0	0	0	..	0	A.
4.1	3.7	3.8	3.9	9,243	66	NW.	5	14	14	8	18	14	1	15	1	0.81	0.39	11	12	7	5	0	0	0	..	0	S.
3.6	5.1	2.7	3.8	10,606	56	NW.	7	7	13	16	15	4	4	27	0	2.99	1.00	13	12	6	8	0	0	0	..	0	O.
..	..	..	..	....	..	....	..	..	..	..	..	..	..	..	..	.....	....	..	..	..	..	..	..	..	..	..	N.
..	..	..	..	....	..	....	..	..	..	..	..	..	..	..	..	.....	....	..	..	..	..	..	..	..	..	..	D.
..	..	..	..	....	..	....	..	..	..	..	..	..	..	..	..	.....	....	..	..	..	..	..	..	..	..	..	Y.

CAPE MENDOCINO, CAL.

[$H=697.$ $h=1.$]

CEDAR KEYS, FLA.

[$H=22.$ $h=35.$]

7 a.m.	3 p.m.	11 p.m.	Mean.	Total (miles).	Maximum.	Direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Total.	Max. 24 hours.	Clear.	Fair.	Cloudy.	Rain or snow.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder-storms.	Auroras.	Months and year.
4.2	5.7	5.4	5.1	7,529	30	S.	24	19	8	5	14	5	3	10	8	4.97	1.96	9	16	6	14	0	0	0	2	0	J.
3.9	3.3	2.9	3.3	6,228	35	W.	29	7	6	9	11	6	12	12	3	9.02	3.27	16	9	3	9	0	0	0	0	0	F.
5.1	4.8	3.6	4.5	5,748	37	S.	16	8	5	4	20	7	22	6	4	3.07	1.74	12	13	6	10	0	0	0	1	0	M.
4.2	4.4	2.8	3.8	6,016	43	S.	4	17	15	4	2	11	26	3	8	0.15	0.11	13	14	3	2	0	0	0	1	0	A.
5.4	5.6	4.4	5.1	6,556	26	SE.	7	9	11	8	19	16	15	8	0	3.48	1.33	7	15	9	10	0	0	0	3	0	M.
6.9	6.0	4.1	5.6	4,585	29	SE.	2	17	8	3	5	17	27	4	8	10.99	3.68	4	20	6	15	0	0	6	9	0	J.
6.5	7.0	6.4	6.6	4,571	23	S.	1	5	7	8	9	30	22	4	7	9.17	4.61	2	17	12	16	0	0	2	9	0	J.
6.8	6.6	6.3	6.6	6,044	30	S.	4	9	7	9	11	25	23	5	0	10.09	2.56	2	15	14	18	0	0	5	9	0	A.
6.2	6.7	6.0	6.3	5,063	28	E. & W.	7	16	18	5	4	12	21	4	3	5.76	3.14	3	18	9	12	0	0	2	5	0	S.
5.6	5.2	4.1	5.0	7,290	45	S.	16	18	7	2	4	11	20	14	1	4.38	2.00	8	14	9	10	0	0	0	1	0	O.
3.6	5.0	4.0	4.2	5,230	33	NW.	7	9	13	5	8	7	11	25	5	1.17	0.57	14	11	5	5	0	0	0	0	0	N.
2.5	5.1	3.4	4.0	6,204	36	S.	13	11	6	4	7	6	12	25	10	3.84	2.07	12	17	2	8	0	1	0	1	0	D.
5.1	5.4	4.4	5.0	71,123	...	......	120	145	110	68	114	151	213	122	52	66.06	4.61	103	179	84	129	0	1	15	41	0	Y.

Monthly and yearly meteorological summaries—Continued.

CHARLESTON, S. C.

[Latitude, 32° 47′ N.; longitude, 79° 56′ W. Local time, 0.20 slow, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a.m.	Temperature. 3 p.m.	Temperature. 11 p.m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew point. 7 a.m.	Dew point. 3 p.m.	Dew point. 11 p.m.	Dew point. Mean.	Relative humidity. 7 a.m.	Relative humidity. 3 p.m.	Relative humidity. 11 p.m.	Relative humidity. Mean.
	In.	*In.*	*In.*	°	°	°	°	°	°	°	°	°	°	°	°				
J ..	30.130	30.[illegible]	29.78	46.5	54.6	50.6	50.7	73	30	[illegible]	44.6	41.0	41.5	43.7	[illegible]	81	[illegible]	77	[illegible]
F ..	30.087	30.40	29.35	42.8	[illegible]	47.7	47.9	67	[illegible]	53.3	40.7	37.6	[illegible]	41.8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
M ..	30.037	30.51	29.[illegible]	46.9	57.7	[illegible]	[illegible]	73	34	[illegible]	44.6	41.2	[illegible]	43.4	[illegible]	81	[illegible]	[illegible]	[illegible]
A ..	30.021	30.43	[illegible]	58.9	70.8	[illegible]	[illegible]	84	42	71.5	[illegible]	[illegible]	51.7	54.6	[illegible]	78	54	[illegible]	[illegible]
M ..	30.017	30.12	29.[illegible]	68.9	77.8	71.3	72.7	90	54	78.9	[illegible]	62.6	61.[illegible]	62.[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
J ..	30.015	30.20	29.[illegible]	78.[illegible]	84.6	77.1	78.[illegible]	[illegible]	64	[illegible]	72.[illegible]	71.1	71.[illegible]	71.[illegible]	71.[illegible]	[illegible]	[illegible]	84	77
J ..	29.994	30.17	29.78	78.4	87.1	80.3	81.[illegible]	[illegible]	[illegible]	[illegible]	75.7	72.7	74.4	74.[illegible]	74.[illegible]	[illegible]	67	84	[illegible]
A ..	[illegible]	30.14	29.71	77.2	[illegible]	79.4	80.[illegible]	[illegible]	[illegible]	87.4	78.[illegible]	73.1	74.0	74.6	[illegible]	87	71	[illegible]	[illegible]
S ..	29.987	30.1[illegible]	29.[illegible]	72.5	80.4	75.3	76.4	[illegible]	[illegible]	81.5	71.1	[illegible]	70.7	70.1	[illegible]	[illegible]	72	[illegible]	[illegible]
O ..	30.042	30.21	29.47	[illegible]	70.4	[illegible]	[illegible]	[illegible]	[illegible]	71.4	[illegible]	[illegible]	[illegible]	[illegible]	57.[illegible]	[illegible]	[illegible]	[illegible]	77
N ..	29.[illegible]	30.5[illegible]	29.[illegible]	53.4	64.7	57.6	[illegible]	[illegible]	34	[illegible]	51.[illegible]	48.3	[illegible]	51.6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
D ..	30.0[illegible]	30.[illegible]	29.5[illegible]	45.7	[illegible]	49.3	[illegible]	76	[illegible]	[illegible]	41.[illegible]	[illegible]	[illegible]	44.[illegible]	[illegible]	[illegible]	[illegible]	72	[illegible]
Y ..	[illegible]	[illegible]	[illegible]	[illegible]	73.1	64.0	65.0	[illegible]	[illegible]	72.[illegible]	[illegible]	[illegible]	[illegible]	57.6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

CHARLOTTE, N. C.

[Latitude, 35° 13′ N.; longitude, 80° 51′ W. Local time, 0.23 slow, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a.m.	Temperature. 3 p.m.	Temperature. 11 p.m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew point. 7 a.m.	Dew point. 3 p.m.	Dew point. 11 p.m.	Dew point. Mean.	Relative humidity. 7 a.m.	Relative humidity. 3 p.m.	Relative humidity. 11 p.m.	Relative humidity. Mean.
J ..	29.[illegible]	30.[illegible]	29.81	[illegible]	45.[illegible]	40.4	40.[illegible]	71	11	[illegible]	32.[illegible]	[illegible]	[illegible]	31.[illegible]	[illegible]	[illegible]	[illegible]	71	[illegible]
F ..	29.181	30.[illegible]	29.51	32.[illegible]	44.6	[illegible]	[illegible]	63	12	47.4	30.7	[illegible]	[illegible]	[illegible]	[illegible]	77	[illegible]	72	[illegible]
M ..	29.[illegible]	30.[illegible]	29.[illegible]	[illegible]	52.[illegible]	44.0	45.[illegible]	[illegible]	24	55.2	[illegible]	31.0	34.6	34.[illegible]	[illegible]	74	[illegible]	[illegible]	[illegible]
A ..	29.231	29.71	29.[illegible]	52.2	67.[illegible]	[illegible]	50.4	[illegible]	34	70.4	40.[illegible]	42.[illegible]	42.4	45.2	43.7	[illegible]	[illegible]	[illegible]	[illegible]
M ..	29.119	29.[illegible]	29.72	62.2	74.[illegible]	[illegible]	67.4	87	45	78.[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	74	[illegible]	72	[illegible]
J ..	29.229	29.47	29.[illegible]	71.2	81.1	73.4	75.[illegible]	90	[illegible]	84.3	67.[illegible]	[illegible]	[illegible]	64.[illegible]	63.7	[illegible]	[illegible]	74	[illegible]
J ..	29.1[illegible]	29.4[illegible]	29.[illegible]	73.7	[illegible]	78.0	78.[illegible]	[illegible]	[illegible]	87.1	[illegible]	67.[illegible]	[illegible]	[illegible]	67.[illegible]	81	[illegible]	[illegible]	[illegible]
A ..	29.161	29.[illegible]	29.[illegible]	72.2	84.[illegible]	74.[illegible]	76.[illegible]	[illegible]	[illegible]	83.1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
S ..	29.277	29.4[illegible]	29.[illegible]	64.[illegible]	77.2	[illegible]	[illegible]	[illegible]	[illegible]	78.4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	72	[illegible]
O ..	29.164	29.4[illegible]	29.5[illegible]	51.0	64.[illegible]	[illegible]	57.2	74	[illegible]	[illegible]	[illegible]	47.[illegible]	[illegible]	42.[illegible]	[illegible]	67	[illegible]	[illegible]	[illegible]
N ..	29.170	29.[illegible]	29.7[illegible]	42.0	57.4	47.2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
D ..	29.[illegible]	29.[illegible]	29.[illegible]	[illegible]	50.[illegible]	41.1	42.[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	44	[illegible]	[illegible]
Y ..	29.[illegible]	29.[illegible]	29.81	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	11	67.[illegible]	[illegible]	[illegible]	[illegible]	47.[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

CHATTANOOGA, TENN.

[Latitude, 35° 4′ N.; longitude, 85° 15′ W. Local time, 0.41 slow, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a.m.	Temperature. 3 p.m.	Temperature. 11 p.m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew point. 7 a.m.	Dew point. 3 p.m.	Dew point. 11 p.m.	Dew point. Mean.	Relative humidity. 7 a.m.	Relative humidity. 3 p.m.	Relative humidity. 11 p.m.	Relative humidity. Mean.
J ..	29.[illegible]	29.7[illegible]	29.[illegible]	[illegible]	42.[illegible]	[illegible]	[illegible]	[illegible]	17	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	60	[illegible]	71	[illegible]
F ..	29.[illegible]	29.[illegible]	29.[illegible]	[illegible]	44.7	[illegible]	[illegible]	[illegible]	8	[illegible]	[illegible]	[illegible]	32.[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	73	[illegible]
M ..	29.[illegible]	29.07	29.[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	72	20	[illegible]	[illegible]	[illegible]	34.[illegible]	34.1	34.[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
A ..	29.242	29.[illegible]	29.[illegible]	53.[illegible]	67.[illegible]	[illegible]	[illegible]	[illegible]	33	70.4	41.4	47.4	42.4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
M ..	29.149	29.[illegible]	29.74	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	44	[illegible]	57.[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	57	[illegible]	[illegible]
J ..	29.247	29.42	29.[illegible]	76.0	[illegible]	73.4	73.4	[illegible]	[illegible]	[illegible]	67.[illegible]	[illegible]	67	67.[illegible]	67.1	[illegible]	[illegible]	[illegible]	77
J ..	29.221	29.41	29.[illegible]	72.2	[illegible]	[illegible]	77.[illegible]	[illegible]	[illegible]	[illegible]	70.[illegible]	[illegible]	[illegible]	71.[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
A ..	29.1[illegible]	29.[illegible]	29.[illegible]	70.[illegible]	[illegible]	74.7	[illegible]	[illegible]	61	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
S ..	29.[illegible]	29.4[illegible]	29.0[illegible]	[illegible]	70.[illegible]	67.[illegible]	[illegible]	[illegible]	51	77.[illegible]	[illegible]	61.4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
O ..	29.[illegible]	29.46	29.72	48.4	[illegible]	54.1	53.7	74	37	64.[illegible]	[illegible]	[illegible]	47.7	[illegible]	47	[illegible]	[illegible]	[illegible]	[illegible]
N ..	29.[illegible]	29.56	29.[illegible]	42.[illegible]	[illegible]	47.[illegible]	[illegible]	71	[illegible]	[illegible]	[illegible]	37.[illegible]	37.[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
D ..	29.[illegible]	29.76	29.72	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	21	51.5	31.0	[illegible]	77	[illegible]	[illegible]	[illegible]	[illegible]	71	[illegible]
Y ..	29.[illegible]	29.7[illegible]	29.[illegible]	51.[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	6	67.[illegible]	[illegible]	47.[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

CHEYENNE, WYO.

[Latitude, 41° 8′ N.; longitude, 104° 48′ W. Local time, 1.59 slow, Eastern.]

Months and year.
J ..
F ..
M ..
A ..
M ..
J ..
J ..
A ..
S ..
O ..
N ..
D ..
Y ..

Monthly and yearly meteorological summaries—Continued.

CHARLESTON, S. C.

[H=52. h=53.]

Cloudiness (in tenths).				Wind.												Precipitation.		Number of days—									
7 a. m.	3 p. m.	11 p. m.	Mean.	Total (miles).	Maximum.	Direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Total.	Max. 24 hours.	Clear.	Fair.	Cloudy.	Rain or snow.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.	Months and year.
																In.	In.										
6.6	7.1	6.0	6.6	6,380	28	SW.	16	26	9	0	1	24	16	8	1	6.88	1.52	5	11	15	18	0	2	0	1	0	J.
5.9	5.2	4.3	4.8	5,602	36	SW.	6	15	6	0	0	20	20	8	0	3.64	1.40	12	6	9	11	0	3	0	1	0	F.
4.5	5.8	4.8	5.0	5,227	24	NE.	12	12	12	8	0	31	15	5	3	1.76	0.68	12	9	10	10	0	0	0	0	0	M.
5.0	4.4	1.7	3.7	5,749	36	NE.	8	16	13	8	0	37	9	8	1	1.17	0.71	12	17	1	6	0	0	0	0	0	A.
3.8	6.4	3.9	4.7	5,151	22	E.	6	8	14	2	4	48	4	8	4	2.20	0.91	11	13	7	10	0	0	1	4	0	M.
5.6	6.6	5.5	5.9	5,026	24	E.	5	12	22	3	4	30	6	9	5	5.95	2.38	4	16	10	12	0	0	6	13	0	J.
5.9	7.0	5.0	6.0	3,975	16	SW.	3	7	9	0	0	58	8	2	5	7.49	2.24	4	18	8	13	0	0	14	13	0	J.
5.5	7.9	5.0	6.[illegible]	4,540	(*)	SE.	1	11	21	8	4	25	12	1	10	19.16	5.69	8	12	11	18	0	0	7	10	0	A.
6.8	7.3	4.2	6.1	5,705	26	E.	8	26	24	11	5	7	4	5	4	3.32	0.80	6	12	11	14	0	0	1	2	0	S.
4.8	5.1	3.1	4.3	5,618	30	NE.	8	24	10	13	5	9	10	6	6	8.09	5.00	12	15	4	9	0	0	0	0	0	O.
4.0	4.7	4.3	4.3	3,106	16	NW., W.	13	0	5	10	7	11	8	19	11	1.94	0.40	10	13	7	10	0	0	0	0	0	N.
3.9	4.2	4.1	4.1	5,480	31	W.	12	9	1	8	7	9	38	9	0	6.80	3.46	14	13	4	10	0	8	0	1	0	D.
5.1	5.9	4.3	5.1	61,794	...	....	89	172	140	61	37	310	148	84	50	67.93	5.69	110	155	97	141	0	8	29	51	0	Y.

* Hurricane, record lost.

CHARLOTTE, N. C.

[H=808. h=47.]

CHATTANOOGA, TENN.

[H=783. h=50.]

CHEYENNE, WYO.

[H=6,105. h=50.]

2.8	3.7	2.5	3.3	10,938	62	W.	11	3	2	8	10	4	28	32	0	0.16	0.05	11	19	1	7	10	30	0	0	0	J.
4.0	4.6	4.2	4.3	9,826	56	NW.	11	6	3	2	7	8	11	37	0	1.39	0.53	10	13	5	10	9	25	0	0	0	F.
4.0	3.2	2.8	3.3	8,621	46	NW.	17	6	1	4	4	5	16	48	0	0.51	0.27	17	8	6	7	8	31	0	0	0	M.
5.7	5.8	3.6	5.0	7,706	40	NW.	19	6	5	9	8	5	11	26	1	3.70	1.83	9	13	8	12	0	17	0	2	0	A.
2.9	5.5	3.5	4.3	6,800	39	NW.	18	6	3	6	19	8	12	21	0	1.33	0.32	14	10	7	12	1	5	0	6	0	M.
3.5	4.0	3.1	4.2	8,249	50	S.	7	4	5	8	30	4	7	20	5	2.75	1.20	9	19	2	12	0	0	0	9	0	J.
3.0	4.3	2.8	3.4	6,671	47	NW.	8	5	6	9	17	6	12	30	2	1.91	1.05	13	17	1	14	0	0	0	10	0	J.
4.0	4.2	4.5	4.2	6,063	39	W.	12	6	9	15	18	6	6	24	2	2.14	0.47	12	12	7	17	0	0	0	8	0	A.
2.1	4.0	3.1	3.1	7,192	44	W.	10	4	6	11	13	6	15	25	1	0.69	0.22	13	15	1	9	0	0	0	0	0	S.
2.9	3.7	3.1	3.6	7,278	39	NW.	14	0	0	3	6	6	16	37	0	0.28	0.10	12	17	2	6	0	10	0	0	0	O.
2.1	5.2	3.5	3.9	8,376	44	NW.	14	2	0	2	9	7	18	35	3	1.11	0.72	11	17	2	5	1	23	0	0	0	N.
3.0	5.2	3.5	3.6	10,496	52	NW.	12	1	1	2	5	9	19	44	0	0.16	0.09	12	19	0	4	6	26	0	0	0	D.
3.7	4.6	3.3	3.8	97,712	...	....	151	58	39	74	141	78	173	371	14	16.11	1.83	148	179	42	115	30	167	0	29	0	Y.

Monthly and yearly meteorological summaries—Continued.

CHICAGO, ILL.

[Latitude, 41° 52′ N., longitude, 87° 38′ W. Local time, 0.50 slow, Eastern.]

Months and year.	Pressure.			Temperature.								Dew point.				Relative humidity.			
	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	Mean. Maximum.	Mean. Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.
	In.	*In.*	*In.*	°	°	°	°	°	°	°	°	°	°	°	°				
J..	29.382	30.06	28.49	14.6	22.1	18.3	18.3	50	−18	27.5	9.6	9.2	13.4	11.7	11.1	78	67	77	74
F..	29.263	29.83	28.60	12.4	20.8	17.1	16.8	47	−14	26.8	8.8	7.1	15.5	12.0	11.5	79	80	80	80
M..	29.336	29.60	28.76	26.6	32.9	30.6	30.0	58	4	36.9	23.7	20.8	24.6	23.6	23.0	79	72	75	75
A..	29.202	30.00	28.82	42.8	48.1	45.1	45.3	76	27	53.9	38.7	37.2	38.2	38.6	38.0	81	70	78	76
M..	29.209	29.40	28.82	49.6	60.0	52.8	52.8	80	34	60.6	46.1	42.0	42.5	44.2	42.9	76	63	74	71
J..	29.311	29.58	28.89	62.4	70.0	63.8	65.4	89	42	73.6	57.1	55.0	54.7	55.7	55.1	78	60	75	71
J..	29.261	29.51	29.04	60.2	70.9	72.2	72.8	94	53	80.8	65.5	62.8	63.6	64.5	63.6	80	65	77	74
A..	29.274	29.60	28.90	64.9	71.3	66.0	68.1	85	55	74.3	62.4	58.2	57.2	59.9	58.4	80	63	76	73
S..	29.323	29.53	28.75	60.1	67.8	63.8	63.9	81	47	70.6	58.3	52.0	54.1	55.4	54.0	77	64	75	72
O..	29.267	30.00	28.76	47.1	55.0	50.9	51.0	69	36	57.6	45.5	41.3	42.5	42.9	42.2	81	64	75	74
N..	29.240	30.08	28.82	30.3	44.4	41.9	41.9	66	28	48.7	36.7	33.3	35.3	34.5	34.4	80	72	76	76
D..	29.311	29.91	28.42	29.2	33.5	30.7	31.1	50	−8	38.9	24.7	24.5	27.6	25.7	25.9	82	79	82	81
Y..	29.290	29.96	28.42	42.2	49.9	46.2	46.4	94	−14	54.4	39.8	37.0	39.0	39.1	38.8	79	68	77	75

CHINCOTEAGUE, VA.

[Latitude, 37° 55′ N.; longitude, 75° 23′ W. Local time, 0.01 slow, Eastern.]

CINCINNATI, OHIO.

[Latitude, 39° 6′ N.; longitude, 84° 30′ W. Local time, 0.38 slow, Eastern.]

Months and year.	Pressure: Mean.	Pressure: Maximum.	Pressure: Minimum.	Temp.: 7 a. m.	Temp.: 3 p. m.	Temp.: 11 p. m.	Temp.: Mean.	Temp.: Maximum.	Temp.: Minimum.	Temp.: Mean Maximum.	Temp.: Mean Minimum.	Dew point: 7 a. m.	Dew point: 3 p. m.	Dew point: 11 p. m.	Dew point: Mean.	Rel. hum.: 7 a. m.	Rel. hum.: 3 p. m.	Rel. hum.: 11 p. m.	Rel. hum.: Mean.
J..	29.485	30.07	28.70	22.6	29.8	25.8	26.1	55	−8	32.7	18.2	15.6	20.5	18.6	18.3	75	68	74	72
F..	29.350	29.90	28.61	17.4	29.3	22.8	23.2	62	−10	33.2	13.6	12.8	17.4	14.7	15.0	82	62	71	72
M..	29.430	29.80	28.96	28.2	36.3	33.0	33.2	71	0	42.6	26.9	22.3	25.1	25.2	24.2	79	62	73	71
A..	29.371	29.74	28.92	45.9	58.8	52.9	52.6	82	28	63.3	44.0	30.9	41.0	42.9	41.3	80	55	71	69
M..	29.275	29.56	28.87	54.8	68.6	61.0	61.6	84	37	71.7	52.4	47.8	46.4	51.2	48.1	78	46	72	65
J..	29.383	29.61	29.05	63.9	76.4	68.5	69.6	90	48	79.6	61.1	57.2	58.0	60.2	58.5	80	54	76	70
J..	29.338	29.52	29.12	70.7	84.9	76.0	77.2	97	63	87.9	68.2	64.2	62.0	65.8	64.0	80	48	72	67
A..	29.318	29.69	28.92	66.2	79.6	71.1	72.3	94	51	82.1	63.8	61.6	50.9	62.9	61.5	86	52	76	71
S..	29.399	29.62	28.96	58.6	73.6	64.8	65.7	84	41	75.8	56.9	54.1	52.7	57.7	55.2	86	62	78	73
O..	29.331	29.68	28.80	46.4	59.0	51.1	52.2	78	31	61.9	44.1	43.3	40.8	44.6	43.0	90	53	80	74
N..	29.335	29.71	29.02	30.9	46.1	43.8	43.8	71	27	50.6	37.7	35.2	35.4	36.1	35.6	84	63	77	75
D..	29.430	29.96	28.61	31.4	39.4	34.8	35.0	60	8	43.0	27.6	25.4	27.0	27.6	26.7	79	63	77	73
Y..	29.371	30.07	28.61	45.5	57.2	50.4	51.0	97	−10	60.4	42.9	40.6	40.6	42.8	40.9	81	57	75	71

CLEVELAND, OHIO.

[Latitude, 41° 30′ N.; longitude, 81° 42′ W. Local time, 0.27 slow, Eastern.]

Months and year.	Pressure: Mean.	Pressure: Maximum.	Pressure: Minimum.	Temp.: 7 a. m.	Temp.: 3 p. m.	Temp.: 11 p. m.	Temp.: Mean.	Temp.: Maximum.	Temp.: Minimum.	Temp.: Mean Maximum.	Temp.: Mean Minimum.	Dew point: 7 a. m.	Dew point: 3 p. m.	Dew point: 11 p. m.	Dew point: Mean.	Rel. hum.: 7 a. m.	Rel. hum.: 3 p. m.	Rel. hum.: 11 p. m.	Rel. hum.: Mean.
J..	29.335	29.91	28.45	17.9	23.8	21.0	20.9	54	−7	28.9	13.4	14.5	17.5	16.6	16.2	86	76	83	82
F..	29.228	29.78	28.38	12.4	20.1	16.7	16.4	47	−15	26.2	7.8	9.5	15.0	11.9	12.1	89	81	81	84
M..	29.296	29.65	28.74	20.6	28.0	24.4	24.4	56	−4	32.8	16.8	17.3	21.4	19.9	19.5	86	77	82	83
A..	29.300	29.67	28.74	40.8	47.7	48.5	44.0	82	23	54.0	36.9	35.3	37.4	36.4	36.4	82	71	77	77
M..	29.208	29.52	28.78	52.4	58.9	55.4	55.6	81	33	64.6	48.2	46.7	47.6	48.2	47.5	82	68	78	76
J..	29.304	29.56	28.68	61.7	69.4	62.5	64.5	88	46	74.2	56.2	54.9	56.1	56.1	55.7	79	64	81	74
J..	29.259	29.46	28.90	67.5	76.6	70.6	71.6	90	53	80.5	64.1	62.6	64.9	64.7	64.1	85	69	82	79
A..	29.240	29.54	28.77	62.3	70.1	64.9	65.8	86	46	74.6	59.5	59.1	61.8	61.0	60.5	90	75	88	84
S..	29.321	29.59	28.66	56.3	68.1	60.2	61.5	84	44	71.1	54.0	52.2	55.0	54.2	53.9	87	64	81	77
O..	29.241	29.60	28.75	45.9	55.3	49.2	50.1	78	34	59.0	43.4	42.7	46.4	44.0	44.4	89	74	89	82
N..	29.201	29.63	28.85	38.3	43.2	40.8	40.8	66	22	46.9	35.7	34.0	36.8	34.8	35.0	85	78	80	81
D..	29.270	29.93	28.44	29.1	34.3	31.0	31.5	61	3	38.9	25.2	26.6	27.2	24.9	25.9	87	76	78	80
Y..	29.267	29.93	28.38	42.1	48.6	45.0	45.6	90	−15	54.3	38.4	37.9	40.5	39.4	39.1	86	73	81	80

Monthly and yearly meteorological summaries—Continued.

CHICAGO, ILL.

[H=661. h=93.]

Cloudiness in tenths. 7 a. m.	3 p. m.	11 p. m.	Mean.	Wind. Total (miles).	Maximum.	Direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Precipitation. Total.	Max. 24 hours.	Number of days— Clear.	Fair.	Cloudy.	Rain or snow.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.	Months and year.
4.2	5.7	4.6	4.8	7,316	22	SW.	5	5	3	2	16	32	22	8	0	3.18	1.24	10	13	8	11	16	28	0	0	0	J.
4.5	6.7	5.1	5.1	4,994	24	NE.	5	6	4	4	10	28	12	12	8	2.01	0.86	10	9	9	11	18	26	0	0	0	F.
5.3	6.8	5.4	5.7	5,493	28	SW.	17	11	3	3	9	20	15	8	7	0.67	0.20	6	17	8	8	7	25	0	0	0	M.
6.2	6.7	5.5	6.1	6,292	24	N.	18	12	15	6	14	7	7	9	2	4.00	1.71	3	10	9	16	0	5	0	0	0	A.
5.2	5.1	4.4	4.9	5,406	30	SW.	28	13	9	10	8	12	9	6	3	3.17	1.23	11	13	7	11	0	0	0	5	0	M.
4.8	5.3	3.3	4.5	4,049	24	N.	13	5	17	10	9	13	11	7	5	5.20	3.44	9	15	6	11	0	0	0	8	0	J.
4.3	4.6	2.5	3.8	4,233	20	N.	14	12	10	8	13	11	10	5	10	2.44	0.93	9	20	2	13	0	0	3	9	0	J.
5.7	4.7	3.4	4.6	6,092	27	N.	16	13	14	9	9	14	9	6	0	11.28	6.19	8	18	5	13	0	0	0	7	0	A.
4.7	4.8	4.0	4.5	5,720	25	S.	12	5	18	9	12	15	12	6	1	2.97	1.05	13	8	9	9	0	0	0	1	1	S.
5.4	7.1	4.0	5.5	6,136	21	NE., N.	18	6	7	6	14	12	16	18	1	3.87	2.22	8	13	10	11	0	0	0	0	0	O.
6.8	7.1	6.1	6.7	6,183	24	SW., W.	7	9	1	6	9	20	21	15	0	2.23	1.17	4	13	13	12	0	4	0	1	0	N.
4.7	5.7	4.9	5.4	6,700	26	SW.	6	4	6	10	10	25	14	8	0	3.35	1.20	6	15	8	15	7	20	0	1	0	D.
5.2	5.8	4.4	5.1	69,162	...	....	154	101	107	85	123	219	158	106	32	44.37	6.19	99	173	93	141	50	108	3	27	1	Y.

CHINCOTEAGUE, VA.

[H=6. h=1]

CINCINNATI, OHIO.

[H=628. h=149.]

CLEVELAND, OHIO.

(H = 696. h = 73.)

7 a. m.	3 p. m.	11 p. m.	Mean.	Total (miles).	Maximum.	Direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Total.	Max. 24 hours.	Clear.	Fair.	Cloudy.	Rain or snow.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.	Months and year.
5.0	6.7	4.9	5.5	9,406	[illegible]	SW.	4	3	3	12	18	15	31	6	0	2.63	0.47	8	13	10	16	18	28	0	0	0	J.
6.1	5.8	3.9	5.1	6,711	[illegible]	S.	9	7	4	7	17	8	27	5	0	1.05	0.57	8	12	8	15	16	28	0	0	0	F.
6.8	5.8	4.7	5.6	7,318	24	SW.	25	5	5	3	13	10	26	6	0	0.87	0.24	6	15	10	10	14	20	0	0	0	M.
6.9	5.5	3.6	5.4	7,728	31	N.	15	13	6	15	13	1	17	7	6	2.52	0.86	6	17	7	14	1	10	0	0	0	A.
5.6	4.1	3.6	4.2	6,465	30	W.	13	20	7	17	8	7	17	8	1	3.88	1.18	11	15	5	13	0	0	0	4	0	M.
3.7	3.4	2.6	3.2	6,395	28	SW.	24	5	4	25	10	7	9	5	1	7.22	2.77	14	16	0	10	0	0	0	6	0	J.
3.8	2.8	2.7	3.1	5,487	24	SW., S.	17	11	10	19	13	9	7	5	2	4.48	1.59	15	15	1	10	0	0	1	10	0	J.
5.4	5.9	6.0	5.8	6,067	27	SW.	12	16	18	16	7	11	1	10	3	5.14	1.14	8	11	12	19	0	0	0	9	0	A.
4.5	4.1	4.8	4.6	6,260	30	N.	11	7	5	22	13	9	6	7	2	2.01	1.81	11	12	7	11	0	0	0	2	0	S.
6.1	5.6	6.1	5.9	6,961	28	N.	8	8	8	29	6	20	8	8	1	3.78	1.14	6	11	14	16	0	0	0	0	0	O.
7.9	8.6	7.8	8.1	6,329	26	S., W.	5	7	2	9	18	23	19	6	1	4.67	1.83	2	6	22	19	0	10	0	1	0	N.
8.5	7.5	7.1	7.7	9,715	30	W.	4	6	4	6	23	17	27	6	0	1.68	0.63	0	15	16	15	9	24	0	0	0	D.
5.8	5.5	4.8	5.4	86,832	...	....	147	108	76	190	161	127	192	74	10	39.93	2.77	95	158	112	170	58	139	1	32	0	Y.

Monthly and yearly meteorological summaries—Continued.

COLUMBUS, OHIO.

[Latitude, 39° 58′ N.; longitude, 83° 0′ W. Local time, 0.32 slow, Eastern.]

Months and year.	Pressure.			Temperature.						Mean.		Dew point.				Relative humidity.			
	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.
	In.	*In.*	*In.*	°	°	°	°	°	°	°	°	°	°	°	°				
J ..	29.251	29.82	28.54	19.7	26.3	22.6	22.9	52	- 8	30.8	15.0	15.7	19.0	17.4	17.4	84	74	80	80
F ..	29.122	29.67	28.35	14.2	24.7	19.4	19 4	58	-11	29.5	9.2	10.9	18.1	15.5	14.8	87	76	84	82
M .	22.197	29.53	28.74	24.8	34.5	20.5	29.6	64	1	38.3	21.9	20.2	28.9	23.4	22.5	82	66	78	75
A ..	29.165	29.56	28.66	43.2	56.1	49.1	49.5	84	23	60.0	39.9	39.2	44.2	42.8	42.1	86	66	80	77
M .	29.073	29.38	28.65	54.9	67.0	59.6	60.7	86	35	71.4	51.0	50.1	53.2	53.5	52.3	85	62	80	76
J ..	29.183	29.42	28.81	63.6	75.2	67.6	68.8	90	46	78.8	59.2	57.3	60.0	59.8	59.0	89	61	76	72
J ..	29.140	29.32	28.94	70.4	83.5	75.1	76.3	97	51	86.0	67.2	65.0	66.6	66.4	66.0	83	58	75	72
A ..	29.127	29.42	28.69	65.1	76.9	67.9	70.0	91	50	79.7	62.5	61.7	64.1	62.8	62.9	89	65	84	79
S ..	29.207	29.44	28.78	57.0	73.1	61.3	63.8	82	39	74.2	53.7	53.1	55.5	56.3	55.0	87	56	84	76
O ..	29.130	29.49	28.67	44.8	57.9	49.0	50.6	77	29	60.8	42.1	41.6	44.5	43.6	43.2	89	63	82	78
N ..	29.121	29.53	28.84	37.5	44.6	40.7	40.9	60	24	47.4	34.4	33.8	36.1	35.4	35.1	86	73	82	80
D ..	29.199	29.78	28.37	30.0	36.6	30.9	32.5	60	1	40.1	24.7	25.3	28.6	25.0	26.3	82	74	78	78
Y ..	29.160	29.82	28.35	43.8	54.8	47.7	48.8	97	-11	58 1	40.1	39.5	42.8	41.8	41.4	85	66	80	77

FORT CONCHO, TEX.

[Latitude, 31° 25′ N.; longitude, 100° 24′ W. Local time, 1.41 slow, Eastern.]

J ..	28.220	28.67	27.75	29.0	45.5	34.9	36.5	68	2	49.3	26.9	27.2	30.7	30.8	29.6	93	60	85	[illegible]
F ..	28.100	28.44	27.64	34.2	55.3	41.0	43.7	80	11	59.9	31.8	29.4	32.4	32.0	31.3	82	45	71	68
M .	28.200	28.48	27.89	44.1	61.8	50.7	52.2	80	30	65.3	42.1	40.8	44.0	44.4	43.1	88	55	79	74
A ..	28.042	28.31	27.78	55.8	75.9	62.3	64.7	90	43	79.1	54.2	51.6	51.7	54.2	53.5	86	51	76	71
M .	28.021	28.30	27.68	59.6	77.9	65.3	67.6	92	44	81.3	57.3	57.3	61.3	59.2	59.3	92	58	81	77
J ..	28.073	28.24	27.82	71.5	93.2	77.9	80.9	108	62	96.7	68.1	67.6	70.1	68.1	68.6	88	48	73	70
J ..	28.102	28.27	27.93	71.9	94.7	79.8	82.1	107	64	98.1	70.5	67.4	69.2	66.2	67.6	86	45	65	66
A ..	28.075	28.24	27.87	71.4	93.9	79.7	81.7	106	62	97.1	69.7	65.9	67.2	66.1	66.4	83	43	65	64
S ..	28.044	28.24	27.83	69.1	84.9	74.8	76.3	94	63	88.6	66.4	67.0	68.8	68.2	68.0	93	60	81	78
O ..	......	......	......	....	....	....	....	...	...	....	....	.....	....	....	....	...	...	...	...
N ..	......	......	......	....	....	....	....	...	...	....	....	.....	....	....	....	...	...	...	...
D ..	......	......	......	....	....	....	....	...	...	....	....	.....	....	....	....	...	...	...	...
Y ..	......	......	......	....	....	....	....	...	...	....	....	.....	....	....	....	...	...	...	...

CONCORDIA, KANS.

[Latitude, 39° 35′ N.; longitude, 97° 41′ W. Local time, 1.31 slow, Eastern.]

J ..	......	......	......	....	....	....	....	...	...	....	....	.....	....	....	....	...	...	...	...
F ..	......	......	......	....	....	....	....	...	...	....	....	.....	....	....	....	...	...	...	...
M ..	......	......	......	....	....	....	....	...	...	....	....	.....	....	....	....	...	...	...	...
A ..	......	......	......	....	....	....	....	...	...	....	....	.....	....	....	....	...	...	...	...
M ..	28.476	28.80	28.19	50.3	66.8	57.9	58.3	84	31	70.5	49.0	48.2	51.1	51.3	50.2	92	60	80	77
J ..	28 508	28.81	28.11	62.8	78.9	69.5	70.4	101	46	82.7	60.4	60.8	67.3	63.0	63.7	93	69	81	81
J ..	28.493	28.73	28.18	68.7	81.8	73.3	74.6	94	52	85.0	65.9	65.8	69.5	68.2	67.8	91	66	85	81
A ..	28.519	28.77	28.19	63.1	80.2	69.9	71.1	97	46	84.0	60.1	60.3	64.0	63.6	62.6	91	58	81	77
S ..	28.523	28.85	28.05	57.6	74.6	64.5	65.6	94	46	77.4	56.2	54.1	57.0	56.5	55.9	88	58	76	74
O ..	28.545	28.86	28.17	41.3	62.2	49.1	50.9	87	24	65.2	37.5	35.9	39.0	37.8	37.6	82	46	67	65
N ..	28.495	28.82	27.77	34.9	49.9	40.5	41.8	75	24	53.2	31.5	31.8	34.6	33.6	33.3	89	58	78	75
D ..	28.587	28.92	28.13	27.6	40.0	32.5	33.4	67	0	43.4	23.7	24.4	30.1	27.5	27.3	88	70	83	80
Y ..	......	......	......	....	....	....	....	...	...	....	....	.....	....	....	....	...	...	...	...

FORT CUSTER, MONT.

[Latitude, 45° 42′ N.; longitude, 107° 34′ W. Local time, 2.10 slow, Eastern.]

J ..	26.819	27.32	26.41	10.1	19.0	14.7	14.6	52	-32	23.6	3.2	- 4.8	10.8	7.8	7.8	79	71	74	75
F ..	26.794	27.18	26.38	17.7	27.8	22.1	22.5	53	-21	32.9	10.8	11.9	18.1	15.7	15.2	79	69	77	75
M .	26.920	27.18	26.69	31.7	48.4	38.7	39.6	68	6	52.5	26.2	26.1	30.2	29.1	28.5	80	53	70	68
A ..	26.791	27.14	26.36	35.5	56.3	46.8	46.2	76	22	60.0	31.6	30.1	30.4	30.9	30.5	82	42	57	60
M .	26.790	27.12	26.43	43.0	66.5	56.2	55.2	87	18	70.9	38.1	32.9	31.2	35.3	33.1	68	30	47	48
J ..	26.812	27.14	26.19	52.5	72.3	62.1	62.3	91	33	76.6	48.5	47.0	49.8	50.4	49.1	82	48	67	66
J ..	26.837	27.06	26.45	58.0	81.5	70.6	70.0	100	44	87.4	55.0	49.9	51.3	52.0	51.1	75	37	54	55
A ..	26.898	27.18	26.49	55.1	78.4	65.2	66.2	99	43	83.9	52.2	45.4	48.6	49.1	47.7	72	40	59	57
S ..	26.816	27.11	25.41	48.3	70.6	58.4	59.1	96	36	75.0	45.0	39.0	41.7	40.8	40.5	72	40	54	56
O ..	26.802	27.23	26.49	36.1	62.7	46.9	48.6	85	17	68.5	32.6	27.4	31.8	30.6	29.8	71	33	54	53
N ..	26.755	27.12	26.32	29.7	50.3	37.7	39.2	72	10	54.6	25.8	24.1	32.3	29.4	28.6	80	53	73	69
D ..	26.824	27.25	26.38	28.8	41.0	29.5	33.1	71	- 7	45.2	20.5	22.2	24.5	21.9	22.9	79	58	74	70
Y ..	26.829	27.32	26.19	37.2	56.2	45.7	46.4	100	-32	60.9	32.4	30.1	33.4	32.8	32.1	77	48	64	[illegible]

Monthly and yearly meteorological summaries—Continued.

COLUMBUS, OHIO.

[H=805. h=70.]

Cloudiness (in tenths).				Wind.												Precipitation.		Number of days—									
7 a.m.	3 p.m.	11 p.m.	Mean.	Total (miles).	Maximum.	Direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Total.	Max. 24 hours.	Clear.	Fair.	Cloudy.	Rain or snow.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder-storms.	Auroras.	Months and year.
																In.	*In.*										
6.0	7.0	4.1	5.7	7,298	36	SW.	2	4	3	11	17	21	28	7	0	3.75	1.29	10	11	10	12	15	27	0	0	0	J.
5.5	6.4	4.2	5.4	5,702	36	W.	5	7	8	4	14	19	20	7	0	2.39	1.14	9	9	10	11	15	27	0	1	0	F.
5.8	6.8	5.0	5.9	6,864	32	SW.	16	10	1	4	6	16	21	19	0	0.53	0.20	8	10	13	13	9	27	0	1	0	M.
6.7	6.1	4.9	5.9	6,171	32	NW.	6	10	12	13	13	18	5	13	0	4.61	1.86	5	14	11	15	0	6	0	2	0	A.
6.1	6.3	3.9	5.4	5,131	30	W.	7	8	10	13	11	17	15	12	0	5.83	1.87	7	15	9	14	0	0	0	8	0	M.
5.4	5.7	3.3	4.8	4,331	32	SW.	16	7	8	9	11	21	12	6	0	5.08	2.49	7	18	5	9	0	0	0	3	0	J.
4.1	5.8	3.7	4.5	3,701	22	SW.	13	11	6	5	10	25	12	11	0	3.28	1.31	10	16	5	12	0	0	7	6	0	J.
4.6	5.9	2.8	4.4	4,276	28	NW.	12	17	9	5	7	17	12	14	0	5.90	1.50	10	18	3	12	0	0	1	5	0	A.
4.4	4.5	4.2	4.4	3,905	27	N.	4	9	6	14	4	25	14	10	4	2.84	1.72	10	14	6	6	0	0	0	0	0	S.
5.0	6.6	4.9	5.5	4,528	24	NW.	14	4	4	15	15	20	7	12	2	3.11	0.86	9	11	11	14	0	2	0	0	0	O.
7.1	8.0	5.7	6.9	4,906	26	NW.	12	9	2	4	9	18	18	18	0	3.08	0.77	5	12	13	13	0	14	0	0	0	N.
7.1	7.2	6.2	6.8	6,572	36	W., NW.	7	5	3	7	4	31	17	19	0	1.85	0.75	4	13	14	14	6	26	0	0	0	D.
5.6	6.4	4.4	5.5	63,522	...	....	114	101	72	104	121	248	181	148	6	42.25	2.49	94	161	110	145	45	129	8	26	0	Y.

FORT CONCHO, TEX.

[H=1,900. h=2.]

7 a.m.	3 p.m.	11 p.m.	Mean.	Total (miles).	Maximum.	Direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Total.	Max. 24 hours.	Clear.	Fair.	Cloudy.	Rain or snow.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder-storms.	Auroras.	Months and year.
4.7	4.5	3.9	4.4	6,266	30	W.	8	16	14	1	13	11	16	5	9	1.30	0.51	15	8	8	6	3	19	0	0	0	J.
2.8	4.9	3.4	3.7	6,645	44	N.	11	11	16	0	17	7	16	3	3	0.41	0.18	12	13	3	5	0	14	0	0	0	F.
5.7	6.3	3.3	5.1	7,002	31	N.	10	19	13	5	18	21	4	3	0	1.74	0.45	7	15	9	8	0	3	0	0	0	M.
4.6	4.3	3.7	4.2	7,755	36	NE., S.	0	12	19	8	23	15	9	2	2	4.16	1.84	9	15	6	9	0	0	1	1	0	A.
5.7	5.2	4.9	5.3	6,541	35	NW.	3	14	15	10	26	5	4	9	7	2.80	1.40	8	14	9	6	0	0	8	8	0	M.
4.9	3.7	4.1	4.2	7,976	53	E.	1	1	9	10	61	4	1	2	1	4.55	2.38	9	18	3	4	0	0	29	1	0	J.
2.9	3.9	1.2	2.7	6,396	45	N.	0	1	12	11	55	5	0	1	8	1.50	1.47	18	13	0	4	0	0	28	2	0	J.
4.3	5.9	3.6	4.6	6,465	32	N.	1	17	13	14	34	5	3	2	4	1.91	0.78	8	20	3	7	0	0	26	7	0	A.
6.3	6.3	2.9	5.5	2,395	24	W.	2	6	9	1	19	1	3	0	4	2.21	1.59	3	9	3	5	0	0	7	4	0	S.
...	...	...	...	......	...	....	...	...	...	...	...	...	...	...	...	....	....	...	...	...	...	...	...	...	...	...	O.
...	...	...	...	......	...	....	...	...	...	...	...	...	...	...	...	....	....	...	...	...	...	...	...	...	...	...	N.
...	...	...	...	......	...	....	...	...	...	...	...	...	...	...	...	....	....	...	...	...	...	...	...	...	...	...	D.
...	...	...	...	......	...	....	...	...	...	...	...	...	...	...	...	....	....	...	...	...	...	...	...	...	...	...	Y.

CONCORDIA, KANS.

[H=1,384. h=34.]

7 a.m.	3 p.m.	11 p.m.	Mean.	Total (miles).	Maximum.	Direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Total.	Max. 24 hours.	Clear.	Fair.	Cloudy.	Rain or snow.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder-storms.	Auroras.	Months and year.
...	...	...	...	......	...	....	...	...	...	...	...	...	...	...	...	....	....	...	...	...	...	...	...	...	...	...	J.
...	...	...	...	......	...	....	...	...	...	...	...	...	...	...	...	....	....	...	...	...	...	...	...	...	...	...	F.
...	...	...	...	......	...	....	...	...	...	...	...	...	...	...	...	....	....	...	...	...	...	...	...	...	...	...	M.
...	...	...	...	......	...	....	...	...	...	...	...	...	...	...	...	....	....	...	...	...	...	...	...	...	...	...	A.
4.2	6.0	2.3	4.2	6,131	48	S.	16	3	9	10	22	6	3	21	3	2.63	....	11	16	4	13	0	1	0	5	0	M.
4.9	5.0	3.4	4.4	6,[illegible]48	29	SE.	13	6	14	23	18	7	4	3	2	1.12	0.44	6	21	3	3	0	0	7	3	0	J.
6.2	5.0	3.9	5.0	6,110	29	SW.	3	14	12	8	30	12	3	5	6	4.90	1.74	10	18	8	9	0	0	11	8	0	J.
4.6	4.8	3.7	4.4	5,069	23	SW.	11	21	13	14	17	4	4	5	4	1.43	0.86	9	20	2	8	0	0	6	4	0	A.
3.7	3.8	2.3	3.3	6,886	35	S.	6	9	15	8	29	10	4	8	1	3.53	2.81	16	9	5	8	0	0	3	1	0	S.
2.8	4.0	2.4	3.1	6,735	29	N.	17	8	8	9	13	9	9	22	3	2.46	1.99	17	11	3	7	0	9	0	1	0	O.
4.4	5.0	3.9	4.4	5,308	32	SW.	8	4	19	9	14	6	6	17	7	0.61	0.30	10	12	8	5	0	17	0	0	0	N.
4.2	4.9	4.6	4.6	6,318	48	NW.	18	5	10	5	16	13	8	14	4	0.43	0.34	14	7	10	4	8	22	0	0	0	D.
...	...	...	...	......	...	....	...	...	...	...	...	...	...	...	...	....	....	...	...	...	...	...	...	...	...	...	Y.

FORT CUSTER, MONT.

[H=3,040. h=21.]

7 a.m.	3 p.m.	11 p.m.	Mean.	Total (miles).	Maximum.	Direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Total.	Max. 24 hours.	Clear.	Fair.	Cloudy.	Rain or snow.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder-storms.	Auroras.	Months and year.
5.8	6.5	5.8	6.0	6,504	...	....	11	8	9	22	1	10	27	4	1	0.08	0.04	5	14	12	3	18	29	0	0	0	J.
5.2	7.7	5.1	6.0	4,866	48	NW.	15	8	5	9	2	9	24	8	4	0.16	0.08	4	17	7	7	14	25	0	0	0	F.
5.3	6.3	4.2	5.3	6,385	49	W.	10	5	8	6	2	20	27	13	2	0.24	0.13	8	14	9	4	0	23	0	0	0	M.
5.9	6.2	4.7	5.6	5,548	36	N.	21	14	17	10	2	2	9	12	3	0.51	0.12	6	16	8	8	0	16	0	0	0	A.
5.6	6.2	5.0	5.6	5,536	39	NW.	12	12	15	9	5	5	16	17	2	0.47	0.27	5	20	6	6	0	3	0	3	0	M.
4.9	5.8	5.7	5.5	5,638	55	W.	15	8	24	18	1	6	6	10	2	4.18	1.82	3	20	7	11	0	0	1	10	0	J.
4.6	4.4	5.5	4.8	7,004	...	....	15	15	25	11	2	8	4	13	0	0.85	0.24	7	20	4	9	0	0	14	8	0	J.
3.5	3.8	2.8	3.4	4,126	...	....	21	28	15	3	1	4	5	5	2	1.60	0.91	11	8	3	7	0	0	10	3	0	A.
5.0	4.0	3.6	4.2	4,571	39	NW.	16	11	32	2	4	5	12	7	1	0.68	0.22	12	14	4	7	0	0	4	0	0	S.
3.1	4.2	3.7	3.7	4,586	32	W., NW.	11	9	23	18	1	5	8	14	3	0.24	0.19	16	11	3	2	0	14	0	0	0	O.
4.6	5.9	2.9	4.5	4,170	24	N., W.	5	4	10	45	8	2	6	10	0	0.24	0.15	7	20	3	4	0	26	0	0	0	N.
5.9	7.1	4.5	5.8	5,141	60	W.	11	1	18	27	6	13	11	6	0	0.09	0.03	4	18	9	4	6	[illegible]	0	0	0	D.
5.0	6.7	4.5	5.1	63,942	...	....	163	123	201	180	35	89	155	119	20	9.34	1.82	88	192	75	72	38	164	29	24	0	Y.

Monthly and yearly meteorological summaries—Continued.

DAVENPORT, IOWA.

[Latitude, 41° 30′ N.; longitude, 90° 38′ W. Local time, 1.02 slow, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a. m.	Temperature. 3 p. m.	Temperature. 11 p. m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.
	In.	In.	In.	°	°	°	°	°	°	°	°
J..	29.482	30.04	28.53	11.7	21.4	17.6	16.9	50	−16	25.5	8.
F..	29.363	29.88	28.84	18.5	22.7	17.3	17.2	45	−17	27.2	7.
M..	29.420	29.76	28.95	29.2	38.9	34.9	34.3	60	8	42.8	26.
A..	29.341	29.70	28.98	44.6	54.4	49.4	49.4	74	28	58.0	41.
M..	29.270	29.56	28.89	51.3	65.6	56.3	57.8	85	29	68.4	48.
J..	29.306	29.60	28.96	62.1	74.7	66.7	68.2	87	46	77.7	59.
J..	29.310	29.55	29.00	69.5	83.5	73.5	75.5	97	55	85.5	66.
A..	29.329	29.67	29.01	62.8	74.7	68.9	68.0	90	48	77.7	59.
S..	29.378	29.59	28.77	57.2	70.8	61.6	63.0	83	45	72.4	55.
O..	29.372	29.61	28.90	42.7	55.5	44.9	48.2	76	29	57.7	41.
N..	29.314	29.68	28.80	33.7	42.4	37.1	38.1	64	23	46.5	31.
D..	29.300	29.93	28.62	21.8	29.6	25.8	25.6	50	−7	33.0	18.
Y..	29.356	30.04	28.52	41.6	52.9	46.1	46.9	97	−18	54.0	38.

DAVIS FORT, TEX.

[Latitude, 30° 39′ N.; longitude, 103° 56′ W. Local time, 1.56 slow, Eastern.]

J..	25.192	25.44	24.90	32.9	40.6	38.9	40.6	72	5	53.6	28.0	26.0	26.4	28.4	25.8	72	[illegible]	61	59
F..	25.109	25.42	24.87	37.8	58.0	47.0	47.9	75	17	62.3	33.8	24.8	23.8	25.1	24.4	61	37	48	44
M..	25.222	25.43	24.97	48.0	60.8	50.7	51.8	78	31	66.0	41.5	26.1	25.3	27.0	26.4	70	43	65	61
A..	25.138	25.32	24.97	52.0	72.2	60.5	61.6	84	37	75.9	48.6	27.6	24.3	28.2	26.7	60	27	47	44
M..	25.122	25.27	24.91	54.5	75.2	63.7	64.5	90	44	79.0	53.1	44.2	40.7	43.0	42.6	72	34	59	53
J..	25.201	25.31	25.01	66.7	85.9	72.7	75.1	98	59	90.4	64.5	61.4	47.7	53.8	51.0	61	31	55	49
J..	25.241	25.32	25.16	61.7	82.6	72.5	73.2	97	58	88.2	62.7	58.2	54.7	57.0	56.0	75	40	60	56
A..	25.231	25.34	25.10	64.0	82.9	71.1	73.0	97	56	88.3	62.4	55.1	52.6	56.8	54.6	77	38	62	56
S..	25.225	25.34	25.08	58.4	79.2	66.6	68.1	89	50	83.1	57.6	50.6	48.3	52.2	50.4	77	37	60	56
O..	25.280	25.35	25.03	48.0	72.5	58.8	59.9	85	35	75.7	47.4	38.2	36.8	38.8	37.6	70	31	53	51
N..	25.200	25.48	24.82	44.5	67.2	53.0	54.9	82	25	70.3	42.2	28.4	27.8	29.5	28.9	57	34	42	41
D..	25.219	25.47	24.75	40.4	60.5	45.8	48.6	74	17	62.8	34.3	24.5	23.1	26.1	24.6	58	38	50	45
Y..	25.194	25.48	24.75	50.9	70.5	58.4	59.9	98	5	74.6	[illegible]	39.4	37.6	40.2	39.0	68	34	54	50

DAYTON, WASH.

[Latitude, 46° 19′ N.; longitude, 117° 59′ W. Local time, 2.59 slow, Eastern.]

J..	28.287	28.77	27.90	22.0	31.6	24.5	26.0	62	−6	34.6	15.0	18.4	22.1	20.6	20.7	86	73	84	81
F..	28.306	28.70	28.01	39.4	46.3	40.5	42.1	66	23	49.0	35.1	32.9	35.6	34.9	34.8	81	69	81	77
M..	28.410	28.72	28.25	39.5	58.6	46.8	48.7	75	29	62.6	36.0	30.7	35.7	33.9	33.4	72	43	62	60
A..	28.241	28.48	27.90	30.6	63.2	49.2	50.7	78	22	67.4	37.2	31.2	35.5	33.7	33.5	73	37	56	55
M..	28.194	28.46	27.87	48.4	67.1	56.3	57.2	87	34	71.1	45.0	41.1	45.1	43.8	43.2	77	40	64	60
J..	28.224	28.46	27.98	52.4	70.5	62.2	61.7	90	38	75.9	50.5	46.6	50.7	50.5	49.3	82	52	64	67
J..	28.232	28.43	28.01	56.8	82.2	70.0	69.7	103	41	88.2	54.2	46.2	48.0	47.2	47.1	60	31	46	46
A..	28.230	28.48	28.08	57.6	84.9	67.9	70.1	109	45	88.4	53.5	42.9	46.1	44.2	44.4	50	28	44	44
S..	28.221	28.49	27.90	50.4	71.6	58.8	60.3	86	30	76.6	47.3	43.0	47.0	45.8	45.1	77	45	68	61
O..	28.312	28.54	28.00	42.5	65.0	48.4	52.0	85	26	68.0	39.1	35.1	39.6	37.0	37.0	76	42	65	61
N..	28.157	28.64	27.66	40.3	50.4	42.3	44.3	67	27	52.9	35.4	35.3	36.6	35.7	36.5	84	66	80	76
D..	......	......	......	...	......	......	......	...	...	......	......	......	......	......	......	...	...	...	...
Y..	......	......	......	...	......	......	......	...	...	......	......	......	......	......	......	...	...	...	...

DEADWOOD, DAK.

[Latitude, 44° 22′ N.; longitude, 103° 43′ W. Local time, 1.56 slow, Eastern.]

5.0	23.2	18.6	18.9	47	−16	26.5	9.7	9.1	13.6	12.6	11.6	77	67	76	72
5.6	25.8	21.0	21.6	50	−15	31.6	12.6	12.5	16.1	14.6	14.4	77	68	77	74
1.1	38.4	31.8	33.1	53	7	41.6	25.8	22.6	25.3	24.5	24.1	77	61	73	71
1.0	47.5	40.4	41.3	65	21	51.6	32.5	28.8	32.6	32.5	31.6	77	60	74	70
2.7	55.5	48.2	48.8	73	17	60.3	40.0	38.8	39.2	40.6	38.9	80	58	76	72
1.3	63.9	57.0	57.4	81	25	67.8	48.5	45.9	51.6	50.7	49.4	82	67	81	77
2.2	73.5	63.8	65.5	90	45	76.8	55.8	51.1	52.6	54.7	52.8	75	51	73	66
4.1	67.8	56.0	60.2	85	39	71.2	50.5	47.6	49.6	56.7	49.5	80	57	77	71
1.8	62.5	52.6	54.7	[illegible]	36	63.1	44.1	41.7	47.0	44.5	44.4	78	60	74	71
3.1	52.9	42.7	45.2	76	18	55.9	35.6	32.6	36.1	37.1	33.9	75	56	69	67
4.1	47.8	38.1	41.0	68	15	50.6	31.4	30.0	34.8	31.1	32.0	79	63	74	73
0.6	38.4	30.0	33.3	58	−2	41.7	24.1	22.1	24.0	22.6	23.1	72	58	72	68
3.5	49.8	42.1	43.4	90	−16	52.2	34.3	21.8	35.3	34.3	33.8	78	60	75	71

Monthly and yearly meteorological summaries—Continued.

DAVENPORT, IOWA.

[H=615. h=77.]

Cloudiness (in tenths).				Wind.												Precipitation.		Number of days—									
7 a. m.	3 p. m.	11 p. m.	Mean.	Total (miles).	Maximum.	Direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Total.	Max. 24 hours.	Clear.	Fair.	Cloudy.	Rain or snow.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder-storms.	Auroras.	Months and year.
																In.	In.										
3.6	5.8	4.1	4.5	6,738	28	S.	4	10	1	3	5	25	18	24	0	2.10	0.66	13	12	6	9	20	29	0	0	0	J.
4.5	5.8	3.9	4.7	5,438	28	N.	6	13	6	5	2	8	23	17	1	1.20	0.86	11	11	6	8	16	26	0	0	0	F.
4.9	6.1	4.9	5.3	7,750	34	W.	5	12	11	0	8	16	16	30	0	0.17	0.10	7	17	7	4	6	31	0	0	0	M.
7.2	7.7	6.7	7.2	7,542	30	SW.	4	12	16	13	11	12	8	19	0	2.47	0.56	0	15	15	15	0	2	0	1	0	A.
4.5	6.6	4.5	5.2	6,116	34	W.	6	8	18	6	6	7	14	27	1	1.94	0.77	6	17	8	6	0	1	0	5	0	M.
6.8	6.5	4.3	5.5	4,620	34	W.	12	10	3	12	17	17	7	11	1	2.98	0.58	6	18	6	12	0	0	0	6	0	J.
5.4	6.6	4.5	5.5	5,573	44	SW.	7	7	16	5	11	31	9	8	0	1.86	0.72	6	18	7	10	0	0	7	9	0	J.
4.5	6.1	4.6	5.1	5,256	26	N.	7	13	16	9	10	12	6	18	2	12.68	4.79	8	17	6	11	0	0	0	5	0	A.
4.1	5.5	4.9	4.8	5,135	24	SW.	8	7	15	10	12	19	3	9	8	4.19	1.27	10	10	10	10	0	0	0	1	0	S.
5.3	6.3	4.2	5.3	4,575	24	NE.	16	18	7	8	9	12	6	16	6	2.71	1.52	9	11	11	9	0	4	0	0	0	O.
5.7	6.9	4.9	5.8	5,004	30	SW.	9	9	7	7	8	10	9	24	7	1.20	1.07	7	12	11	6	0	17	0	1	0	N.
5.3	4.9	6.3	5.8	5,154	28	NW.	8	7	4	9	9	22	17	15	2	1.95	1.16	7	17	7	13	11	25	0	0	0	D.
5.1	6.4	4.7	5.4	68,878	...	....	94	121	119	87	107	191	130	218	28	24.25	4.79	90	175	100	112	53	126	7	28	0	Y.

DAVIS FORT, TEX.

[H = 4,928. h = 1.]

DAYTON, WASH.

[H=1,667. h=1.]

DEADWOOD, DAK.

[H = 4,600. h = 52.]

Monthly and yearly meteorological summaries—Continued.

DELAWARE BREAKWATER, DEL.

[Latitude, 38° 48′ N.; longitude, 75° 10′ W. Local time, 0.00, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a. m.	Temperature. 3 p. m.	Temperature. 11 p. m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew point. 7 a. m.	Dew point. 3 p. m.	Dew point. 11 p. m.	Dew point. Mean.	Relative humidity. 7 a. m.	Relative humidity. 3 p. m.	Relative humidity. 11 p. m.	Relative humidity. Mean.
	In.	In.	In.	°	°	°	°	°	°	°	°	°	°	°	°				
J ..	30.118	30.83	29.37	34.1	37.2	34.5	35.3	63	12	43.2	27.6	28.7	27.7	28.5	28.3	81	69	79	76
F ..	29.977	30.51	29.18	26.8	30.7	27.7	28.4	52	9	35.4	22.7	20.4	22.0	21.1	21.2	77	70	76	75
M .	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
A ..	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
M .	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
J ..	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
J ..	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
A ..	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
S ..	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
O ..	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
N ..	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
D ..	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Y ..	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......

DENVER, COLO.

[Latitude, 39° 45′ N.; longitude, 105° W. Local time, 2.00 slow, Eastern.]

J ..	24.671	24.95	24.26	23.5	35.8	28.0	29.1	64	-11	39.7	16.7	10.7	16.1	15.6	14.1	60	49	61	57
F ..	24.620	24.99	24.27	26.9	38.0	32.2	32.4	60	0	44.4	20.9	17.4	21.7	20.4	19.8	69	57	65	64
M .	24.787	25.00	24.58	29.0	48.2	38.3	38.5	68	5	52.6	26.1	20.6	19.7	24.4	21.6	71	40	61	57
A ..	24.668	25.01	24.27	37.8	53.9	45.5	45.7	71	18	58.4	35.4	30.4	28.8	32.9	30.7	76	43	66	62
M .	24.720	25.00	24.46	43.9	61.2	53.0	52.7	86	27	64.4	41.9	36.6	32.3	37.0	35.3	77	40	60	59
J ..	24.773	25.08	24.24	52.7	74.9	68.7	63.8	86	41	78.4	51.2	48.1	37.8	48.4	41.4	71	30	51	51
J ..	24.836	24.99	24.59	59.8	81.8	69.3	70.3	97	50	85.6	58.6	50.2	46.6	52.5	49.8	72	31	57	54
A ..	24.846	25.02	24.62	57.1	78.8	68.2	68.0	93	46	82.0	55.7	49.3	48.2	51.0	49.5	77	37	57	57
S ..	24.797	25.08	24.37	50.7	72.6	62.5	61.9	90	42	76.0	49.6	40.1	41.6	44.0	41.9	69	38	55	54
O ..	24.815	25.05	24.48	39.9	60.7	47.2	49.3	80	22	64.4	37.0	29.1	29.9	33.5	30.8	68	36	61	55
N ..	24.009	25.04	24.10	35.3	53.5	39.8	42.9	75	11	57.0	30.8	24.5	25.0	28.3	25.9	67	36	65	56
D ..	24.738	25.06	24.15	29.0	45.7	33.8	36.2	74	-6	48.7	24.2	18.7	20.0	20.8	19.8	66	42	68	57
Y ..	24.747	25.08	24.10	40.5	58.8	48.5	49.2	97	-11	62.6	37.3	30.9	30.6	33.6	31.7	70	40	60	57

DES MOINES, IOWA.

[Latitude, 41° 35′ N.; longitude, 93° 37′ W. Local time, 1.14 slow, Eastern.]

J ..	29.238	29.76	28.51	7.6	15.6	11.3	11.5	47	-20	19.4	2.1	0.5	6.2	4.5	3.7	72	66	73	70
F ..	29.139	29.60	28.61	10.0	19.1	14.6	14.6	50	-20	22.7	6.0	3.0	9.5	7.9	6.8	72	66	74	71
M .	29.193	29.52	28.78	27.5	40.1	33.8	33.8	63	7	43.5	25.5	20.8	26.0	26.3	24.4	75	58	74	69
A ..	29.081	29.45	28.75	43.3	54.9	48.6	48.9	76	26	59.6	40.8	38.6	42.0	42.2	40.9	83	63	79	75
M .	29.034	29.34	28.68	51.1	67.9	58.3	59.1	92	28	71.9	48.8	45.6	48.2	49.2	47.7	82	51	72	68
J ..	20.106	29.40	28.74	62.4	76.7	68.0	69.0	93	44	81.1	60.4	58.4	62.2	62.0	60.9	87	62	81	77
J ..	29.066	29.32	28.82	68.6	84.1	74.9	75.9	100	54	88.5	66.7	64.3	67.3	68.1	66.6	86	58	80	75
A ..	20.094	29.42	28.81	61.8	76.9	67.6	68.8	90	46	79.7	60.4	58.2	61.5	62.2	60.6	88	60	83	77
S ..	29.103	29.41	28.51	57.1	70.6	62.7	63.5	87	45	73.0	55.6	53.6	55.6	57.4	55.5	88	61	83	78
O ..	29.009	29.45	28.82	42.5	56.5	47.4	48.8	77	20	58.6	40.5	38.6	42.1	41.0	40.6	86	61	79	75
N ..	29.071	29.42	28.43	34.1	45.2	38.2	39.2	66	21	48.0	32.2	30.3	33.7	33.0	32.3	86	65	81	77
D ..	29.156	29.63	28.57	24.5	32.8	27.9	28.4	56	-3	35.7	20.6	20.3	23.7	23.1	22.4	84	69	82	78
Y ..	29.115	29.76	28.43	40.9	53.4	46.1	46.8	100	-20	56.8	38.3	36.0	39.8	39.7	38.5	82	62	78	74

DETROIT, MICH.

[Latitude, 42° 20′ N.; longitude, 83° 3′ W. Local time, 0.32 slow, Eastern.]

J ..	29.347	29.98	28.50	19.6	26.8	22.6	23.0	58	-7	30.9	14.3	10.6	18.6	13.7	14.3	68	70	69	69
F ..	29.254	20.81	28.50	11.3	21.5	17.1	16.6	50	-12	27.4	6.8	2.1	12.5	9.5	8.0	66	68	72	69
M .	29.325	29.68	28.08	21.5	30.3	26.8	26.2	55	-2	34.5	18.1	13.9	22.2	18.9	18.3	72	72	71	72
A ..	29.321	29.68	28.71	40.6	50.2	44.4	45.1	77	20	54.1	36.8	32.4	38.8	35.8	35.7	73	66	72	70
M .	29.222	29.52	28.82	52.1	62.4	55.9	56.8	80	30	65.7	48.8	44.6	48.4	46.1	46.4	77	62	70	70
J ..	29.316	29.57	28.92	60.4	72.4	64.8	65.9	87	44	75.8	56.4	53.5	57.7	56.2	55.8	78	61	74	71
J ..	29.269	29.53	28.99	68.9	81.3	73.8	74.7	90	54	83.9	64.9	62.2	65.4	64.9	64.2	80	59	74	71
A ..	29.267	29.58	28.73	62.7	71.5	65.8	66.7	86	48	74.2	59.3	58.1	60.0	59.7	59.3	85	68	81	78
S ..	29.335	29.61	28.82	57.4	68.6	62.0	62.7	81	41	70.8	54.9	51.5	53.4	53.2	52.7	81	60	74	71
O ..	29.269	29.64	28.75	46.3	55.2	50.4	50.6	72	28	58.1	43.7	42.2	43.7	44.2	43.4	86	66	80	77
N ..	29.226	29.69	28.86	39.8	44.3	42.3	42.1	67	29	47.7	37.1	35.7	37.6	37.8	37.0	85	78	84	82
D ..	29.286	29.95	28.45	30.9	35.5	32.4	32.9	55	1	39.8	26.5	26.7	28.5	27.6	27.0	84	76	83	81
Y ..	29.286	29.95	28.45	42.6	51.7	46.5	46.9	90	-12	55.2	39.0	36.1	42.6	39.0	38.6	78	67	75	74

Monthly and yearly meteorological summaries—Continued.

DELAWARE BREAKWATER, DEL.

[$H=20$. $h=96$.]

Cloudiness (in tenths). 7 a. m.	3 p. m.	11 p. m.	Mean.	Wind. Total (miles).	Maximum.	Direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Precipitation. Total.	Max. 24 hours.	Number of days— Clear.	Fair.	Cloudy.	Rain or snow.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder-storms.	Auroras.	Months and year.
																In.	*In.*										
6.0	5.3	4.5	5.3	12,476	53	SE.	2	16	0	6	12	16	6	29	0	3.20	0.97	8	15	8	12	6	18	0	..	0	J.
7.0	4.9	5.2	5.7	12,207	32	NE.	10	14	5	5	5	4	5	30	6	1.91	0.97	6	15	8	11	11	24	0	..	0	F.
																											M.
																											A.
																											M.
																											J.
																											J.
																											A.
																											S.
																											O.
																											N.
																											D.
																											Y.

DENVER, COLO.

[$H=5,294$. $h=60$.]

DES MOINES, IOWA.

[$H=849$. $h=45$.]

DETROIT, MICH.

[$H=662$. $h=71$.]

Monthly and yearly meteorological summaries—Continued.

DODGE CITY, KANS.

[Latitude, 37° 45′ N.; longitude, 100° W. Local time, 1.40 slow, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a. m.	Temperature. 3 p. m.	Temperature. 11 p. m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew point. 7 a. m.	Dew point. 3 p. m.	Dew point. 11 p. m.	Dew point. Mean.	Relative humidity. 7 a. m.	Relative humidity. 3 p. m.	Relative humidity. 11 p. m.	Relative humidity. Mean.
	In.	*In.*	*In.*	°	°	°	°	°	°	°	°	°	°	°	°				
J ..	27.473	27.87	26.75	12.8	24.5	17.8	18.4	49	-18	27.4	8.6	9.6	18.0	14.4	14.0	87	76	86	83
F ..	27.389	27.71	26.91	19.0	34.6	23.8	25.8	60	- 5	38.0	15.1	14.8	21.8	19.0	18.5	84	62	82	76
M ..	27.496	27.77	27.07	31.0	51.8	39.9	40.9	75	13	55.8	28.8	27.2	30.7	30.4	29.4	86	48	71	68
A ..	27.334	27.72	26.91	44.9	65.1	53.1	54.4	79	33	68.2	43.2	39.9	37.1	39.1	38.7	83	38	63	61
M ..	27.363	27.65	27.10	51.1	67.6	57.5	58.7	84	33	71.0	49.2	47.0	49.1	50.5	48.9	86	54	79	73
J ..	27.391	27.72	27.01	63.4	80.1	70.2	71.2	95	51	83.4	61.8	57.7	58.5	60.8	59.0	83	51	74	69
J ..	27.404	27.55	27.15	68.7	85.5	74.8	76.3	97	57	88.7	67.1	64.2	65.7	66.7	65.5	86	53	77	72
A ..	27.418	27.61	27.12	65.3	82.0	72.1	73.1	95	52	85.2	64.5	60.4	61.4	62.5	61.4	85	51	78	69
S ..	27.408	27.72	26.94	57.9	76.1	63.9	66.0	88	48	78.5	56.6	54.5	54.9	55.7	55.0	89	51	76	72
O ..	27.437	27.74	27.13	41.5	63.6	48.8	51.3	83	29	65.6	39.9	36.7	35.8	38.2	36.9	83	38	69	63
N ..	27.361	27.71	26.68	37.4	55.7	42.6	45.2	75	21	57.6	35.1	30.9	31.2	33.5	31.9	78	45	72	65
D ..	27.439	27.74	26.85	31.0	44.8	33.9	36.6	70	1	46.9	27.3	25.9	30.9	29.4	28.9	83	62	84	76
Y ..	27.409	27.87	26.68	43.7	61.0	49.9	51.5	97	-18	63.9	41.4	39.1	41.3	41.7	40.7	84	53	75	71

DUBUQUE, IOWA.

[Latitude, 42° 30′ N.; longitude, 90° 44′ W. Local time, 1.03 slow, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a. m.	Temperature. 3 p. m.	Temperature. 11 p. m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew point. 7 a. m.	Dew point. 3 p. m.	Dew point. 11 p. m.	Dew point. Mean.	Relative humidity. 7 a. m.	Relative humidity. 3 p. m.	Relative humidity. 11 p. m.	Relative humidity. Mean.
J ..	29.405	29.97	28.50	6.6	17.3	13.0	12.3	47	-22	21.1	1.5	- 3.1	- 2.2	- 2.1	- 4.1	58	45	58	50
F ..	29.296	29.81	28.74	6.8	19.9	13.3	13.3	48	-30	23.0	2.3	- 2.4	6.9	3.7	2.7	65	57	66	63
M .	29.342	29.71	28.81	24.6	35.7	30.6	30.3	60	- 1	39.0	22.1	16.4	19.1	19.9	18.5	71	51	64	62
A ..	29.277	29.63	28.92	42.1	52.5	47.0	47.2	74	25	55.8	39.0	36.5	37.6	38.8	37.5	80	59	72	71
M .	29.208	29.48	28.83	49.7	65.3	55.2	56.7	86	26	68.6	46.8	42.3	42.1	44.9	43.1	76	48	69	64
J ..	29.289	29.60	28.87	61.1	73.7	65.2	66.7	88	44	77.2	57.9	55.4	56.5	57.5	56.5	82	56	77	72
J ..	29.248	29.49	29.00	68.0	82.0	71.8	73.8	97	52	84.6	64.3	62.7	65.0	65.6	64.4	83	58	83	75
A ..	29.274	29.63	28.96	60.4	73.8	64.9	66.4	86	46	76.3	57.9	55.9	57.5	59.1	57.5	85	58	82	75
S ..	29.301	29.55	28.69	55.4	69.8	60.0	61.7	86	42	71.4	53.3	51.3	52.5	54.3	52.7	87	56	82	75
O ..	29.283	29.59	28.96	40.8	54.6	45.0	46.8	77	28	56.6	39.1	36.8	38.3	38.6	37.6	86	57	79	74
N ..	29.255	29.64	28.73	33.2	42.8	36.7	37.6	62	19	45.7	30.8	28.9	31.3	31.2	30.5	84	65	81	76
D ..	29.330	29.87	28.55	21.3	29.4	24.2	25.0	51	- 9	32.3	17.2	17.0	21.4	19.7	19.4	83	73	83	80
Y ..	29.293	29.97	28.50	39.2	51.4	43.9	44.8	97	-22	54.3	36.0	32.7	35.5	35.9	34.7	78	57	74	70

DULUTH, MINN.

[Latitude, 46° 48′ N.; longitude, 92° 6′ W. Local time, 1.08 slow, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a. m.	Temperature. 3 p. m.	Temperature. 11 p. m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew point. 7 a. m.	Dew point. 3 p. m.	Dew point. 11 p. m.	Dew point. Mean.	Relative humidity. 7 a. m.	Relative humidity. 3 p. m.	Relative humidity. 11 p. m.	Relative humidity. Mean.
J ..	29.318	29.89	28.61	- 6.6	5.4	- 0.4	- 0.5	40	-41	8.8	-12.3	-12.0	- 3.9	- 7.1	- 7.7	77	66	72	72
F ..	29.249	29.75	28.74	- 2.2	12.0	5.0	4.9	40	-32	14.9	- 6.1	- 7.5	3.2	- 1.1	- 1.8	78	68	75	74
M .	29.318	29.72	28.70	11.6	24.1	17.2	17.6	47	-17	26.8	7.8	5.9	16.2	10.7	10.9	77	72	75	75
A ..	29.268	29.61	28.70	32.5	41.5	36.4	36.8	72	5	46.8	27.8	24.8	25.9	24.9	25.0	72	58	64	65
M .	29.183	29.50	28.72	43.2	51.9	45.8	47.0	78	27	56.1	38.7	33.9	31.0	33.1	32.7	70	49	63	61
J ..	29.253	29.60	28.85	53.7	61.8	56.8	57.3	86	33	66.6	48.6	46.8	44.3	45.5	45.3	77	59	70	66
J ..	29.179	29.46	28.73	62.1	70.7	63.7	65.5	94	49	74.1	56.6	53.7	53.2	52.9	53.3	75	58	70	67
A ..	29.240	29.63	28.86	56.6	66.4	50.5	60.8	81	44	68.7	54.0	49.8	51.0	51.2	50.7	79	60	75	71
S ..	29.226	29.53	28.54	49.2	59.3	53.1	53.9	82	38	64.1	47.1	43.1	43.4	43.9	43.5	80	60	78	71
O ..	29.251	29.55	28.86	37.8	46.4	40.8	41.7	68	25	49.9	35.8	31.8	31.5	32.0	31.6	78	60	72	70
N ..	29.245	29.61	28.74	29.2	35.0	31.5	31.9	43	20	36.6	28.2	25.6	28.3	28.0	27.3	86	76	86	83
D ..	29.269	29.84	28.75	15.3	23.4	18.9	19.2	44	-20	27.5	11.9	10.9	14.9	13.9	13.2	82	70	80	77
Y ..	29.250	29.89	28.54	31.9	41.5	35.6	36.3	94	-41	45.0	28.2	25.4	28.2	27.3	27.0	78	63	73	71

EASTPORT, ME.

[Latitude, 44° 54′ N.; longitude, 66° 59′ W. Local time, 0.32 fast, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a. m.	Temperature. 3 p. m.	Temperature. 11 p. m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew point. 7 a. m.	Dew point. 3 p. m.	Dew point. 11 p. m.	Dew point. Mean.	Relative humidity. 7 a. m.	Relative humidity. 3 p. m.	Relative humidity. 11 p. m.	Relative humidity. Mean.
J ..	29.875	30.65	28.90	17.6	23.3	20.0	20.3	48	-11	29.3	12.3	11.5	15.7	14.2	13.8	76	72	78	76
F ..	29.779	30.35	28.94	14.8	22.0	18.7	18.5	43	-11	26.0	11.4	7.9	12.7	13.1	11.2	74	67	78	73
M .	29.844	30.48	29.14	20.1	26.4	22.0	22.8	48	- 5	28.5	15.9	18.6	16.5	15.4	16.2	75	66	75	72
A ..	29.862	30.39	29.32	37.7	44.1	37.7	39.8	60	23	46.0	33.9	28.8	29.5	29.4	29.2	71	59	73	68
M .	29.909	30.26	29.12	45.8	52.9	43.9	47.5	73	31	54.9	40.1	38.6	40.2	38.2	39.0	77	65	81	74
J ..	29.813	30.13	29.25	54.9	61.1	52.2	56.1	82	39	63.7	48.0	46.7	48.3	46.3	47.1	75	66	81	74
J ..	29.864	30.17	29.48	60.2	67.5	57.2	61.6	78	49	69.9	53.5	54.7	55.9	53.2	54.6	83	68	87	79
A ..	29.874	30.17	29.52	57.4	66.0	56.9	60.1	75	45	67.8	53.4	52.2	54.9	52.9	53.8	88	69	87	80
S ..	29.904	30.30	28.69	52.3	59.8	51.2	54.4	71	38	61.6	47.1	48.3	49.7	47.7	48.6	86	70	88	82
O ..	28.954	30.30	29.20	46.3	51.0	46.3	47.9	61	29	53.3	42.6	42.1	42.6	42.2	42.3	86	75	86	82
N ..	29.818	30.32	29.34	37.6	41.7	38.4	39.2	57	24	44.6	33.8	32.1	31.9	33.2	32.4	80	69	82	77
D ..	29.803	30.61	28.85	26.1	30.5	26.9	27.8	53	7	34.4	18.8	20.7	22.8	21.1	21.5	79	72	78	77
Y ..	29.858	30.65	28.69	39.2	45.5	39.3	41.3	82	-11	48.3	34.2	33.1	35.1	33.9	34.0	79	68	81	76

Monthly and yearly meteorological summaries—Continued.

DODGE CITY, KANS.

[H = 2,517. h = 87.]

DUBUQUE, IOWA.

[H = 666. h = 48.]

DULUTH, MINN.

[H = 672. h = 56.]

EASTPORT, ME.

[H = 61. h = 58.]

Monthly and yearly meteorological summaries—Continued.

ELLIOTT, FORT, TEX.

[Latitude, 35° 30′ N.; longitude 100° 27′ W. Local time, 1.41 slow, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a. m.	Temperature. 3 p. m.	Temperature. 11 p. m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew point. 7 a. m.	Dew point. 3 p. m.	Dew point. 11 p. m.	Dew point. Mean.	Relative humidity. 7 a. m.	Relative humidity. 3 p. m.	Relative humidity. 11 p. m.	Relative humidity. Mean.
	In.	*In.*	*In.*	°	°	°	°	°	°	°	°	°	°	°	°				
J ..	27.305	27.63	26.67	21.7	34.9	25.1	27.2	58	– 6	36.9	16.6	17.5	22.3	20.6	20.1	85	63	82	77
F ..	27.221	27.50	26.77	26.1	41.4	29.1	32.2	...	– 2	.....	21.7	20.7	24.1	23.1	22.6	81	56	78	72
M .	27.323	27.58	26.97	36.4	56.0	43.4	45.3	82	18	59.6	33.7	31.3	31.6	34.4	32.4	83	44	72	66
A ..	27.179	27.51	26.79	47.6	65.4	54.9	56.0	82	32	69.0	45.5	41.2	40.8	42.4	41.5	80	46	66	64
M .	27.194	27.45	26.90	51.9	67.6	58.4	59.8	82	35	71.8	50.4	49.4	50.4	51.1	50.3	91	57	78	75
J ..	27.226	27.44	26.95	64.8	80.3	71.5	72.2	95	54	83.6	62.7	61.1	62.7	64.5	62.8	88	50	86	76
J ..	27.256	27.38	27.10	68.2	86.9	76.6	77.2	95	54	89.4	66.5	62.4	64.0	64.4	63.6	81	48	66	65
A ..	27.259	27.41	27.04	65.9	84.1	73.8	74.6	99	50	87.1	64.4	58.7	59.8	59.0	59.2	79	47	63	63
S ..	27.252	27.46	26.93	58.6	79.6	65.6	67.9	89	40	82.1	57.6	54.7	54.2	54.4	54.4	88	46	80	68
O ..	27.279	27.53	27.02	42.6	67.7	50.2	53.5	86	31	71.4	41.1	36.4	36.6	39.0	37.3	80	35	67	61
N ..	27.203	27.55	26.58	38.3	61.9	42.0	47.4	83	21	63.6	34.3	28.1	26.8	29.9	28.2	68	33	64	55
D ..	27.276	27.57	26.57	33.6	49.5	36.2	39.8	77	zero	52.2	28.6	28.7	33.8	31.1	31.2	84	59	82	75
Y ..	27.248	27.63	26.57	46.3	64.6	52.2	54.4	99	– 6	.....	42.6	40.8	42.3	42.8	42.0	82	49	72	68

EL PASO, TEX.

[Latitude, 31° 47′ N.; longitude, 106° 30′ W. Local time, 2.06 slow, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a. m.	Temperature. 3 p. m.	Temperature. 11 p. m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew point. 7 a. m.	Dew point. 3 p. m.	Dew point. 11 p. m.	Dew point. Mean.	Relative humidity. 7 a. m.	Relative humidity. 3 p. m.	Relative humidity. 11 p. m.	Relative humidity. Mean.
J ..	26.303	26.61	26.01	32.9	50.3	41.8	41.7	66	15	56.6	29.7	23.3	21.7	25.4	23.5	66	[illegible]	55	53
F ..	26.208	26.57	25.93	39.2	60.2	50.8	49.9	76	26	66.5	35.9	22.0	15.0	19.9	19.0	53	12	33	35
M .	26.295	26.53	26.02	46.9	66.4	56.4	56.6	84	29	72.0	44.5	33.0	26.0	31.9	30.3	61	26	44	43
A ..	26.188	26.41	25.94	51.7	74.9	64.2	63.6	90	38	81.5	50.2	30.9	24.6	25.8	27.1	47	16	28	30
M .	26.107	26.35	25.95	58.2	80.5	70.2	69.6	101	49	89.8	57.0	37.6	30.3	36.0	34.6	52	21	34	36
J ..	26.239	26.38	26.01	66.8	90.2	78.0	78.3	107	59	99.2	65.0	48.3	35.4	41.8	40.0	47	19	33	32
J ..	26.271	26.41	26.10	70.7	91.8	80.9	81.1	108	66	102.0	70.0	58.2	54.2	56.4	56.3	66	29	46	47
A ..	26.274	26.43	26.06	70.5	89.5	79.0	79.7	110	61	97.0	69.1	55.9	53.0	53.5	54.1	61	30	44	45
S ..	26.265	26.46	26.03	62.8	82.9	72.5	72.6	98	49	88.7	60.9	49.1	46.6	47.5	47.7	63	30	43	45
O ..	26.289	26.47	26.07	51.2	74.2	61.4	62.3	86	34	77.7	48.3	36.5	37.6	35.8	36.6	59	26	41	43
N ..	26.292	26.55	25.85	43.1	65.0	53.2	53.8	78	23	68.0	39.8	29.5	29.0	29.7	29.4	61	27	41	43
D ..	26.335	26.67	25.83	35.7	57.0	47.4	46.7	72	12	60.8	31.6	23.7	20.6	24.6	23.0	62	26	44	44
Y ..	26.261	26.67	25.83	52.4	73.6	62.9	63.0	110	12	80.0	50.2	36.9	32.8	35.7	35.1	58	26	46	41

ERIE, PA.

[Latitude, 42° 7′ N.; longitude, 80° 5′ W. Local time, 0.20 slow, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a. m.	Temperature. 3 p. m.	Temperature. 11 p. m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew point. 7 a. m.	Dew point. 3 p. m.	Dew point. 11 p. m.	Dew point. Mean.	Relative humidity. 7 a. m.	Relative humidity. 3 p. m.	Relative humidity. 11 p. m.	Relative humidity. Mean.
J ..	29.322	29.91	28.50	21.3	26.4	24.1	23.9	57	– 4	30.9	16.7	14.4	18.5	17.9	16.9	75	72	77	74
F ..	29.232	29.79	28.36	14.9	22.9	19.6	19.1	48	–12	28.0	9.5	9.6	14.0	12.8	13.1	79	75	78	77
M .	29.298	29.68	28.72	21.2	28.8	25.1	25.0	53	– 1	33.2	16.7	15.8	17.5	18.7	17.3	79	68	76	73
A ..	29.301	29.70	28.74	42.6	46.8	43.5	44.3	84	22	53.2	36.0	33.5	35.1	35.8	34.6	71	66	74	70
M .	29.207	29.48	28.81	54.3	58.9	55.2	56.1	81	31	64.3	47.8	47.0	46.3	47.9	47.1	77	64	77	73
J ..	29.289	29.57	28.89	62.0	67.5	61.4	63.6	85	45	73.3	54.4	53.9	55.3	54.3	54.5	75	66	78	73
J ..	29.246	29.46	29.00	69.2	74.9	68.8	71.0	90	53	79.7	63.6	60.2	62.4	61.6	61.4	73	66	78	72
A ..	29.243	29.53	28.72	63.6	69.4	63.2	65.4	86	48	74.1	58.7	57.1	59.0	57.1	57.7	80	70	81	77
S ..	29.324	29.50	28.88	58.1	66.1	60.0	61.4	81	43	70.7	53.8	49.2	51.1	50.4	50.2	73	61	72	69
O ..	29.244	29.61	28.74	47.0	54.6	48.5	50.0	78	32	59.5	43.1	40.2	42.7	41.7	41.5	78	66	78	74
N ..	29.196	29.60	28.89	39.1	42.6	40.5	40.7	71	23	49.1	35.0	32.3	33.0	33.4	33.2	77	78	77	76
D ..	29.256	29.94	28.38	29.8	33.5	30.9	31.4	65	3	41.5	24.5	24.2	26.1	25.4	25.2	80	74	80	78
Y ..	29.263	29.94	28.36	43.6	49.4	45.1	46.0	90	–12	54.8	38.3	36.4	38.7	38.1	37.7	76	68	77	74

ESCANABA, MICH.

[Latitude, 45° 48′ N.; longitude, 87° 5′ W. Local time, 0.48 slow, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a. m.	Temperature. 3 p. m.	Temperature. 11 p. m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew point. 7 a. m.	Dew point. 3 p. m.	Dew point. 11 p. m.	Dew point. Mean.	Relative humidity. 7 a. m.	Relative humidity. 3 p. m.	Relative humidity. 11 p. m.	Relative humidity. Mean.
J ..	29.321	29.88	28.54	1.7	12.5	6.6	6.9	35	–26	15.1	–1.5	–3.5	2.7	0.1	–0.2	75	65	74	71
F ..	29.256	29.79	28.71	–1.7	14.0	5.2	5.8	41	–25	15.6	–5.3	–7.9	3.0	–3.1	–2.7	74	60	72	69
M .	29.328	29.74	28.54	6.1	22.7	13.3	14.0	48	–24	25.3	0.7	–1.2	10.9	6.4	5.4	71	61	74	69
A ..	29.337	29.68	28.79	30.2	41.2	34.1	35.2	54	10	43.3	26.7	22.7	26.3	26.0	25.0	72	57	72	68
M .	29.214	29.52	28.67	42.8	53.8	46.3	47.6	76	27	56.4	39.4	34.2	37.2	37.1	36.2	72	56	72	68
J ..	29.288	29.62	28.90	54.4	66.4	57.4	59.4	80	34	69.6	49.0	44.8	48.8	47.4	47.0	71	55	79	68
J .	29.243	29.56	28.94	62.6	73.8	66.3	67.6	87	47	75.7	58.6	54.8	59.0	56.6	57.5	76	61	77	71
A ..	29.284	29.65	28.81	56.1	64.8	58.0	59.6	83	39	67.1	52.1	50.9	52.1	52.2	51.7	83	66	83	77
S ..	29.328	29.57	28.89	50.5	60.6	54.7	55.3	77	30	64.5	46.8	44.9	46.9	47.7	46.5	82	68	78	74
O ..	29.313	29.62	28.88	37.9	46.5	41.8	42.1	63	24	48.8	35.5	33.4	35.5	35.9	34.9	86	66	80	78
N ..	29.269	29.69	28.70	32.4	37.3	34.1	34.6	50	21	39.2	30.3	29.3	30.9	29.6	29.9	88	78	88	83
D ..	29.301	29.96	28.63	20.1	25.7	22.7	22.8	43	–10	28.6	17.1	16.1	19.1	18.6	17.9	84	76	84	81
Y ..	29.290	29.96	28.54	32.8	43.3	36.7	37.6	87	–26	45.6	29.1	26.5	31.0	29.8	29.1	78	64	76	73

Monthly and yearly meteorological summaries—Continued.

ELLIOTT, FORT, TEX.

H=2,650. h=1.

Cloudiness (in tenths).				Wind.												Precipitation.		Number of days—									
7 a. m.	3 p. m.	11 p. m.	Mean.	Total (miles).	Maximum.	Direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Total.	Max. 24 hours.	Clear.	Fair.	Cloudy.	Rain or snow.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder-storms.	Auroras.	Months and year.
																In.	In.										
3.1	4.6	2.7	3.4	8,141	40	N.	10	2	0	10	18	10	8	30	8	0.45	0.37	19	7	5	3	10	23	0	0	0	J.
2.6	4.7	2.9	3.4	6,710	48	NW.	23	0	1	9	11	4	12	15	10	0.87	0.72	15	10	3	4	..	22	0	0	0	F.
2.3	4.4	3.2	3.6	7,481	44	N.	13	6	1	11	19	8	7	22	6	1.86	1.05	14	14	3	6	0	13	0	0	0	M.
5.4	5.6	2.8	4.6	9,795	51	S.	11	7	1	18	26	8	2	14	8	4.67	2.37	9	18	3	9	0	0	0	2	0	A.
5.2	5.5	4.7	5.1	8,605	36	SE.	16	8	7	16	18	6	2	14	7	7.23	3.32	9	15	7	10	0	0	0	0	0	M.
5.3	4.2	4.8	4.8	8,708	40	W.	7	6	4	32	25	7	0	8	5	9.82	2.30	8	16	6	12	0	0	4	6	0	J.
3.6	3.5	2.4	3.3	7,604	30	NW.	1	1	1	16	37	17	4	8	8	3.62	3.47	14	16	1	3	0	0	14	4	0	J.
3.7	3.3	3.5	3.5	6,461	40	NW.	9	9	8	12	28	14	4	9	7	4.94	1.44	15	12	4	9	0	0	9	5	0	A.
3.1	2.9	1.1	2.4	8,604	38	NW.	12	3	3	11	39	11	2	6	4	0.65	0.34	16	13	1	3	0	0	0	1	0	S.
1.7	3.0	1.5	2.1	7,719	45	N.	12	2	0	7	17	12	2	26	8	0.60	0.42	20	8	1	2	0	2	0	0	0	O.
2.3	3.8	1.9	2.8	6,581	51	NW.	6	6	3	6	13	14	6	23	8	0.25	0.25	16	11	1	2	0	8	0	0	0	N.
4.0	4.4	3.2	3.9	8,807	64	NW.	8	4	3	9	21	12	4	31	1	2.11	0.61	14	10	7	8	4	19	0	0	0	D.
3.6	4.1	2.9	3.5	93,212	..	....	128	49	27	157	270	134	51	201	77	37.07	3.47	169	150	42	72	..	92	27	18	0	Y.

EL PASO, TEX.

H=3,764. h=34.

ERIE, PA.

H=681. h=66.

ESCANABA, MICH.

H=606. h=34.

Monthly and yearly meteorological summaries—Continued.

FORT SMITH, ARK.

[Latitude, 35° 22′ N.; longitude, 94° 24′ W. Local time, 1.17 slow, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a. m.	Temperature. 8 p. m.	Temperature. 11 p. m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew point. 7 a. m.	Dew point. 8 p. m.	Dew point. 11 p. m.	Dew point. Mean.	Relative humidity. 7 a. m.	Relative humidity. 8 p. m.	Relative humidity. 11 p. m.	Relative humidity. Mean.
	In.	In.	In.	°	°	°	°	°	°	°	°	°	°	°	°				
J..	29.693	30.23	28.93	26.8	38.4	31.7	32.3	69	2	42.9	24.1	23.3	30.4	27.9	27.2	86	74	86	82
F..	29.572	30.01	29.11	28.1	43.6	35.6	35.8	74	1	40.7	25.0	23.1	29.0	28.2	26.8	82	60	75	72
M.	29.642	30.00	29.31	39.4	55.8	48.8	47.8	80	24	59.9	37.1	34.6	37.2	38.3	36.7	84	53	71	69
A.	29.483	29.88	29.14	54.4	69.2	61.7	61.8	84	40	73.6	52.2	50.1	54.9	53.8	52.9	86	62	76	75
M.	29.451	29.75	29.09	58.1	74.3	64.3	65.6	86	41	76.5	56.6	55.5	59.7	59.6	58.3	91	61	85	79
J..	29.508	29.70	29.26	70.1	82.5	74.0	75.5	93	61	86.1	67.9	67.8	71.2	70.6	69.9	93	70	90	84
J..	29.506	29.67	29.34	73.5	88.3	78.1	80.0	99	64	91.6	71.5	71.5	74.6	75.2	73.8	94	65	91	83
A..	29.486	29.66	29.26	69.7	86.4	75.5	77.2	97	57	88.9	68.3	66.8	69.6	70.6	69.0	91	50	85	78
S..	29.497	29.73	29.27	63.6	80.9	69.1	71.2	91	49	83.0	62.3	63.3	61.5	63.4	61.7	89	53	82	75
O..	29.527	29.92	29.23	48.4	68.0	55.1	57.2	88	32	71.8	46.8	44.6	46.2	48.8	46.5	87	49	80	72
N..	29.525	29.87	29.00	42.4	60.9	50.2	51.2	80	25	63.8	40.3	37.0	37.1	39.1	37.7	82	45	67	65
D..	29.643	30.01	28.82	34.4	49.8	40.2	41.5	75	10	52.5	31.5	27.8	30.3	31.8	29.8	79	49	72	67
Y..	29.544	30.23	28.82	50.7	66.5	57.0	58.1	99	1	70.0	48.6	46.9	50.1	50.6	49.2	87	58	80	75

FRISCO, UTAH.

[Latitude, 38° 25′ N.; longitude, 113° 16′ W. Local time, 2.33 slow, Eastern.]

J..	......	......	......	......	......	......	......	...	...	......	......	......	......	......	......	...	...	...	...
F..	......	......	......	......	......	......	......	...	...	......	......	......	......	......	......	...	...	...	...
M.	......	......	......	......	......	......	......	...	...	......	......	......	......	......	......	...	...	...	...
A..	......	......	......	......	......	......	......	...	...	......	......	......	......	......	......	...	...	...	...
M.	......	......	......	......	......	......	......	...	...	......	......	......	......	......	......	...	...	...	...
J..	......	......	......	......	......	......	......	...	...	......	......	......	......	......	......	...	...	...	...
J..	23.784	23.90	23.64	66.1	78.1	73.3	72.5	92	58	82.2	64.2	34.8	30.5	32.3	32.5	33	19	24	26
A..	23.790	23.92	23.60	63.8	77.2	70.2	70.4	96	44	80.5	61.1	42.8	48.8	43.5	43.4	50	34	42	42
S..	23.742	23.92	23.47	57.3	70.2	68.3	66.6	81	36	73.8	55.2	30.1	28.8	28.3	29.1	37	22	29	30
O..	23.778	23.96	23.56	48.6	61.4	52.7	54.2	77	27	63.8	45.9	25.2	23.1	24.6	24.3	43	26	37	35
N..	23.683	24.04	23.18	35.2	44.7	38.6	39.5	66	14	47.8	32.7	25.5	25.8	27.6	26.3	69	54	67	63
D..	23.744	24.09	23.33	30.6	40.6	33.9	35.0	59	8	43.7	27.5	24.1	25.2	22.4	23.9	77	58	65	67
Y..	......	......	......	......	......	......	......	...	...	......	......	......	......	......	......	...	...	...	...

GALVESTON, TEX.

[Latitude, 29° 18′ N.; longitude, 94° 47′ W. Local time, 1.19 slow, Eastern.]

J..	30.136	30.70	29.78	47.5	53.2	51.0	50.6	73	28	57.4	44.1	43.5	46.6	45.4	45.2	86	79	83	82
F..	30.030	30.38	29.64	49.4	55.8	53.2	52.6	70	28	60.2	45.8	45.0	46.1	47.0	46.0	85	73	89	79
M.	30.115	30.48	29.72	57.8	63.8	60.9	60.7	73	48	67.1	54.7	52.4	54.4	54.4	53.7	83	74	80	79
A..	29.971	30.28	29.74	68.9	75.0	71.7	71.9	84	60	76.7	66.8	64.9	66.4	66.6	66.0	87	75	85	83
M.	29.907	30.11	29.61	73.1	79.8	75.7	76.2	88	58	81.4	70.6	68.0	67.8	68.0	67.9	84	68	77	76
J..	30.014	30.15	29.83	81.2	87.5	83.5	84.1	92	73	88.8	79.2	73.6	73.0	73.5	73.4	78	68	72	71
J..	30.021	30.18	29.87	81.9	88.8	84.0	84.9	94	75	90.3	79.7	75.1	74.4	75.4	75.0	80	68	76	73
A..	29.967	30.11	29.85	81.1	87.9	83.6	84.2	92	72	88.8	79.3	75.4	74.6	75.2	75.1	83	65	76	75
S..	29.928	30.05	29.82	77.5	82.3	80.0	79.9	91	68	84.3	75.3	73.2	73.6	73.9	73.6	87	70	82	82
O..	30.021	30.36	29.81	65.9	73.7	69.6	69.7	82	49	75.1	63.7	59.7	58.5	60.0	59.4	81	60	72	71
N..	30.051	30.34	29.61	62.2	67.9	64.5	64.9	80	46	70.4	59.1	56.2	57.0	56.5	56.6	81	70	76	76
D..	30.160	30.49	29.48	54.5	60.7	57.7	57.6	72	34	63.6	51.2	49.0	51.0	51.5	50.5	83	72	81	78
Y..	30.027	30.70	29.48	66.8	73.0	69.6	69.8	94	28	75.8	64.1	61.3	62.0	62.3	61.9	83	70	78	77

GRAND HAVEN, MICH.

[Latitude, 43° 5′ N.; longitude, 86° 18′ W. Local time, 0.45 slow, Eastern.]

J..	29.306	29.95	28.44	19.8	22.2	20.0	20.7	43	0	27.9	15.2	14.2	16.2	14.5	15.0	79	77	79	78
F..	29.281	29.83	28.67	11.4	18.4	15.2	15.0	41	−7	24.6	7.8	6.7	11.5	9.8	9.3	81	74	79	79
M.	29.347	29.72	28.68	19.2	27.8	23.1	23.4	45	−5	32.7	16.0	14.2	20.4	17.6	17.4	80	72	79	77
A..	29.341	29.65	28.83	39.5	47.0	41.6	42.7	73	25	50.7	36.3	33.0	34.6	34.3	34.0	78	64	76	72
M.	29.246	29.53	28.87	49.7	57.3	51.7	52.9	77	32	62.3	45.1	41.6	43.5	43.5	42.9	75	62	73	71
J..	29.347	29.61	28.97	57.4	63.2	58.9	59.8	82	39	68.3	51.7	50.3	40.5	50.5	50.1	78	68	75	72
J..	29.294	29.56	29.09	64.1	71.2	66.7	67.3	86	46	76.4	59.7	58.5	58.5	59.0	58.7	82	66	77	75
A..	29.308	29.63	28.90	58.2	64.0	60.1	60.8	86	44	68.1	54.6	53.8	54.8	54.9	54.5	86	78	84	81
S..	29.354	29.57	28.84	55.7	64.1	59.0	59.6	80	39	67.1	52.3	50.5	52.1	51.8	51.5	83	68	78	76
O..	29.205	29.63	28.81	42.3	50.1	45.0	45.8	69	23	54.9	39.6	38.7	40.9	39.0	39.8	87	72	83	81
N..	29.262	29.67	28.89	37.3	41.0	38.3	38.9	68	25	46.3	33.7	31.8	32.6	32.0	32.2	79	73	80	77
D..	29.308	29.97	28.47	28.3	29.1	28.1	28.5	48	2	34.2	23.4	24.3	24.4	24.3	24.3	85	82	85	84
Y..	29.312	29.97	28.44	40.2	46.3	42.3	42.9	86	−7	51.1	36.3	34.8	36.6	36.1	35.8	81	70	79	77

Monthly and yearly meteorological summaries—Continued.

FORT SMITH, ARK.
[H=470. h=48.]

Cloudiness (in tenths). 7 a. m.	3 p. m.	11 p. m.	Mean.	Wind. Total (miles).	Maximum.	Direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Precipitation. Total.	Max. 24 hours.	Number of days— Clear.	Fair.	Cloudy.	Rain or snow.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder-storms.	Auroras.	Months and year.
																In.	*In.*										
3.6	5.5	4.4	4.5	4,707	30	W.	11	18	20	3	3	6	12	14	6	1.90	0.86	13	11	7	9	4	21	0	0	0	J.
4.7	4.5	3.6	4.3	4,204	28	NW.	8	12	15	3	3	11	12	16	6	1.60	1.55	9	14	5	3	2	22	0	0	0	F.
5.7	4.4	4.2	4.8	4,418	24	NW.	13	10	12	6	6	10	10	17	9	1.68	0.64	12	10	9	8	0	9	0	1	0	M.
[illegible]	5.5	4.3	5.0	4,479	26	E.	10	6	28	14	5	6	7	12	5	7.03	4.30	10	11	9	13	0	0	0	5	0	A.
[illegible]	[illegible]	4.2	5.4	2,829	24	N.	7	6	20	6	7	6	11	5	[illegible]	2.60	0.89	8	14	9	11	0	0	0	4	0	M.
[illegible]	5.0	4.0	5.4	2,798	22	NW., N	8	18	19	9	11	7	8	3	17	4.68	1.06	8	11	11	13	0	0	6	8	0	J.
[illegible]	5.4	2.2	4.0	2,379	17	SW.	3	8	26	1	10	15	7	2	23	2.48	0.75	12	14	5	7	0	0	22	7	0	J.
4.9	5.2	3.1	4.4	2,582	[illegible]	N.	6	9	27	3	9	9	9	1	21	2.99	1.26	11	13	7	6	0	0	16	6	0	A.
5.5	6.3	3.5	5.1	3,654	16	N.	8	7	42	7	6	2	2	4	12	0.99	0.48	11	11	8	5	0	0	1	6	0	S.
[illegible]	4.4	2.9	4.0	3,604	24	NW.	11	6	25	8	3	8	4	12	[illegible]	2.31	1.71	12	10	9	7	0	0	0	1	0	O.
4.1	4.6	3.4	4.0	3,217	26	W.	7	4	25	6	4	8	9	9	18	1.12	0.47	13	11	6	4	0	6	0	3	0	N.
5.5	5.0	3.5	4.7	4,412	[illegible]	N.	6	5	40	5	4	3	8	14	8	1.26	0.73	11	13	7	8	1	17	0	0	0	D.
4.6	5.3	3.9	4.7	42,674	..	....	96	109	300	71	71	90	94	109	163	31.61	4.30	131	142	91	89	7	75	45	40	0	Y.

FRISCO, UTAH.
[H=——. h=28.]

Cloudiness (in tenths). 7 a. m.	3 p. m.	11 p. m.	Mean.	Wind. Total (miles).	Maximum.	Direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Precipitation. Total.	Max. 24 hours.	Number of days— Clear.	Fair.	Cloudy.	Rain or snow.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder-storms.	Auroras.	Months and year.
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	J.
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	F.
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	M.
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	A.
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	M.
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	J.
1.7	4.9	2.6	3.1	9,676	37	SW.	5	4	0	1	10	[illegible]	4	10	0	0.15	0.12	16	12	3	2	0	0	2	5	0	J.
2.4	6.2	4.0	4.2	7,172	35	SW.	15	4	2	3	12	[illegible]	12	10	6	2.96	2.60	10	15	8	6	0	0	1	11	0	A.
1.1	2.5	0.2	1.3	7,978	42	SW.	19	8	1	0	7	[illegible]	7	7	0	0.07	0.07	24	6	0	1	0	0	0	0	0	S.
1.7	2.7	0.7	1.7	6,777	36	SW.	20	0	3	2	5	[illegible]	8	7	3	0.46	0.37	25	6	0	2	0	2	0	1	0	O.
4.2	4.6	2.8	4.3	8,072	42	SW.	14	4	0	1	10	51	2	7	1	0.97	0.60	13	11	6	7	0	11	0	0	0	N.
4.6	4.0	3.2	4.6	6,046	40	NW.	16	3	1	5	4	48	5	6	5	0.15	0.09	11	13	7	6	3	21	0	0	0	D.
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	Y.

GALVESTON, TEX.
[H=40. h=51.]

GRAND HAVEN, MICH.
[H=[illegible]. h=74.]

Cloudiness (in tenths). 7 a. m.	3 p. m.	11 p. m.	Mean.	Wind. Total (miles).	Maximum.	Direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Precipitation. Total.	Max. 24 hours.	Number of days— Clear.	Fair.	Cloudy.	Rain or snow.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder-storms.	Auroras.	Months and year.
8.6	9.3	8.7	8.9	11,003	37	NW.	5	8	6	6	15	17	22	14	0	2.20	1.08	1	6	24	26	20	26	0	0	0	J.
7.8	7.2	6.9	7.3	7,064	36	SW.	6	8	8	5	11	16	12	16	1	1.57	0.44	3	9	16	14	20	28	0	0	0	F.
6.5	5.7	5.2	5.8	7,969	49	NW.	11	8	4	5	11	17	11	15	11	1.02	0.24	5	16	10	13	12	29	0	0	0	M.
6.7	[illegible]	5.7	5.7	9,101	35	NW.	9	14	12	7	12	9	3	17	6	1.38	0.56	2	19	9	15	1	10	0	1	0	A.
5.4	4.0	2.8	4.1	7,884	37	W.	5	9	11	1	20	14	8	16	9	1.17	0.45	10	16	4	5	0	0	0	0	1	M.
4.2	3.4	3.4	3.7	6,460	31	N.	4	5	6	3	28	16	14	14	0	3.64	1.63	12	16	2	9	0	0	0	7	0	J.
5.5	4.5	4.0	4.7	6,127	36	S., SW.	6	4	7	7	20	9	17	14	9	2.13	2.02	10	16	5	11	0	0	0	6	0	J.
5.8	5.2	4.6	5.2	6,125	28	NW.	11	6	12	9	12	6	9	17	11	4.82	1.22	8	15	8	16	0	0	0	7	0	A.
5.6	4.2	5.3	[illegible]	6,816	32	N.	5	2	17	12	17	11	12	7	7	4.71	2.77	11	10	9	9	0	0	0	1	1	S.
7.3	6.7	5.9	6.6	6,957	34	W.	8	20	14	15	10	7	8	9	2	4.15	2.27	7	7	17	17	0	2	0	0	0	O.
9.0	8.6	8.7	8.8	8,538	36	W.	10	8	13	7	8	9	15	18	2	1.68	0.84	0	7	23	16	0	10	0	0	0	N.
[illegible]	9.0	7.7	8.2	10,213	50	NW.	7	12	10	11	18	14	9	17	3	2.39	0.89	0	10	21	18	12	25	0	0	0	D.
6.6	6.2	5.7	6.2	94,604	-	....	90	104	121	91	179	140	139	168	65	35.81	2.77	[illegible]	147	148	171	65	130	0	22	2	Y.

Monthly and yearly meteorological summaries—Continued.

GRANT, FORT, ARIZ.

[Latitude, 32° 39′ N.; longitude, 109° 57′ W. Local time, 2.20 slow, Eastern.]

Months and year.	Pressure.			Temperature.						Mean.		Dew point.				Relative humidity.			
	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.
	In.	*In.*	*In.*	°	°	°	°	°	°	°	°	°	°	°	°				
J..	25.240	25.46	24.99	33.1	49.5	40.6	41.1	65	20	53.2	32.4	23.8	27.7	26.7	26.1	68	44	58	57
F..	25.188	25.45	24.94	36.3	54.5	46.6	45.8	73	25	60.1	35.8	25.3	23.3	23.9	24.2	64	32	42	46
M.	25.251	25.43	25.09	44.7	60.9	58.6	53.1	77	37	66.4	44.1	34.4	34.5	34.7	34.5	68	40	51	53
A..	25.168	25.40	25.03	48.8	66.2	58.3	57.8	82	36	72.6	48.2	34.3	30.2	32.3	32.3	58	27	38	41
M.	25.148	25.23	24.98	55.2	74.7	66.7	65.5	94	48	80.4	54.9	32.8	35.3	34.9	34.3	44	26	33	34
J..	25.235	25.38	25.07	62.5	79.8	72.4	71.6	92	49	85.8	62.0	36.3	40.7	39.3	38.8	39	27	32	33
J..	25.271	25.37	25.17	68.9	85.2	79.0	77.7	100	62	91.2	68.2	42.4	51.4	51.4	48.4	40	33	41	38
A..	25.265	25.34	25.20	66.9	83.4	76.0	75.4	96	60	87.0	66.8	46.1	52.2	54.0	50.8	50	36	50	45
S..	25.238	25.34	25.12	63.4	81.1	72.6	72.4	91	56	84.2	62.7	37.9	44.3	44.7	42.3	41	29	40	37
O..	25.243	25.35	25.09	55.1	74.9	65.4	65.1	86	45	77.6	54.6	29.0	38.7	35.9	34.5	37	28	35	34
N..	25.249	25.43	24.87	46.5	61.7	54.1	54.1	76	34	64.8	45.7	30.2	36.7	34.7	33.9	55	42	50	49
D..	25.274	25.53	24.89	39.6	56.3	47.4	47.8	60	22	59.3	38.7	24.2	29.9	28.7	27.6	56	39	51	48
Y..	25.280	25.53	24.87	51.8	69.0	61.1	60.6	100	20	73.6	51.1	33.1	37.1	36.8	35.7	52	34	43	43

GREENCASTLE, IND.

[Latitude, 39° 39′ N.; longitude, 86° 51′ W. Local time, 0.47 slow, Eastern.]

J..	29.175	29.72	28.38	17.2	24.7	21.0	21.0	52	-15	29.7	12.8	12.9	17.5	17.2	15.9	83	75	85	81
F..	29.043	29.57	28.43	14.8	25.1	19.0	19.6	60	-13	30.6	9.8	11.4	16.5	15.1	14.3	86	71	85	81
M.	29.129	29.48	28.62	28.2	38.4	31.9	32.8	63	2	41.9	24.7	23.8	26.2	24.8	24.9	83	62	75	74
A..	29.063	29.38	28.63	45.7	57.4	50.0	51.0	77	26	60.4	42.7	38.7	43.1	41.9	41.2	77	61	75	71
M.	28.997	29.27	28.58	54.4	67.2	58.9	60.2	84	36	69.6	52.7	47.8	49.7	48.9	48.8	79	53	71	69
J..	29.104	29.33	28.73	62.8	74.1	67.2	68.0	86	43	76.9	60.8	57.6	60.5	59.7	59.3	83	63	77	75
J..	29.066	29.25	28.89	69.5	81.4	74.3	75.1	92	53	83.7	67.8	65.2	67.7	66.8	66.6	87	64	78	76
A..	29.041	29.30	28.64	63.5	76.4	67.9	69.3	89	47	78.1	61.8	59.6	62.0	61.4	61.0	88	62	80	77
S..	29.105	29.34	28.62	57.8	70.0	62.3	63.4	80	39	71.6	56.5	53.2	56.2	55.5	55.0	85	63	79	76
O..	29.035	29.38	28.56	45.8	57.4	49.7	51.0	73	33	59.1	44.0	41.8	43.9	43.6	43.1	86	63	80	76
N..	29.032	29.39	28.70	38.4	46.8	41.3	42.2	69	26	49.4	35.5	33.7	35.6	35.1	34.8	84	67	79	76
D..	29.117	29.64	28.84	29.4	36.5	31.1	32.3	55	-2	39.9	25.0	24.5	26.7	25.8	25.7	82	69	81	77
Y..	29.075	29.72	28.34	44.0	54.6	47.9	48.8	92	-15	57.6	41.2	39.2	42.1	41.3	40.9	84	65	79	76

HATTERAS, N.C.

[Latitude, 35° 15′ N.; longitude, 75° 40′ W. Local time, 0.02 slow, Eastern.]

J..	30.155	30.67	29.70	47.0	49.3	47.3	47.9	70	26	56.1	40.6	41.9	42.5	41.7	42.0	83	79	82	81
F..	29.981	30.48	29.34	40.2	42.5	40.9	41.2	64	20	49.1	34.7	35.5	34.7	34.2	34.8	83	75	78	79
M.	30.059	30.54	29.65	42.0	47.7	43.5	44.4	66	26	51.8	37.6	37.7	38.2	39.4	38.4	85	71	86	81
A..	30.055	30.53	29.62	56.3	61.7	56.9	58.3	76	38	65.9	51.8	50.4	50.7	52.0	51.0	82	69	84	78
M.	29.939	30.18	29.56	65.3	68.9	64.6	66.3	79	51	71.7	61.4	61.8	62.5	61.9	62.1	89	81	91	87
J..	30.048	30.27	29.72	72.6	75.8	70.7	73.0	87	59	78.3	67.6	68.0	66.3	66.3	66.9	86	73	87	82
J..	30.009	30.23	29.74	76.9	81.9	75.8	78.2	87	61	83.7	72.9	72.2	72.3	72.0	72.2	86	73	89	83
A..	29.986	30.19	29.53	77.4	80.2	76.3	78.0	87	64	83.0	73.6	71.6	71.0	71.5	71.4	83	74	86	81
S..	30.054	30.30	29.41	71.2	74.7	70.3	72.1	85	57	77.8	67.7	66.7	65.3	64.4	65.5	86	73	83	81
O..	29.978	30.28	29.34	62.6	67.3	62.5	64.1	81	48	69.6	59.1	55.8	56.2	55.7	55.9	79	69	79	76
N..	29.989	30.38	29.58	52.2	57.8	54.2	54.7	77	39	61.1	48.5	45.6	47.6	47.0	46.7	79	70	78	75
D..	30.070	30.67	29.38	45.5	49.8	47.3	47.5	68	28	54.6	40.8	40.6	40.9	39.9	40.5	84	73	77	78
Y..	30.027	30.67	29.34	59.1	63.1	59.2	60.5	87	20	66.8	54.7	54.0	54.0	53.8	53.9	84	73	83	80

HELENA, MONT.

[Latitude, 46° 33′ N.; longitude, 112° 4′ W. Local time, 2.28 slow, Eastern.]

J..	25.786	26.20	25.39	18.1	23.5	21.5	21.0	57	-15	29.5	12.2	10.1	10.6	11.6	10.8	71	59	67	66
F..	25.758	26.12	25.42	24.9	31.0	28.6	28.2	53	-4	37.4	21.7	16.8	17.1	19.1	17.7	71	57	67	65
M.	25.913	26.11	25.64	35.0	45.2	41.6	40.6	62	19	50.9	32.4	25.8	28.7	27.4	27.3	69	54	58	61
A..	25.771	26.09	25.39	39.9	51.6	45.7	45.7	69	22	56.0	37.1	28.2	28.9	30.1	29.1	66	45	57	56
M.	25.775	26.01	25.47	42.6	58.1	52.3	51.0	79	22	63.0	40.8	32.6	34.3	36.4	34.4	68	42	56	55
J..	25.809	26.08	25.36	48.6	63.4	58.4	56.8	86	34	68.5	46.7	41.6	45.0	45.9	44.2	77	53	65	65
J..	25.852	26.01	25.58	55.8	71.9	66.5	64.7	92	44	77.7	53.0	44.6	48.6	48.0	47.1	67	46	53	55
A..	25.881	26.10	25.60	54.0	71.5	66.9	64.1	93	38	77.8	50.5	46.1	54.5	54.6	51.7	76	56	66	66
S..	25.824	26.06	25.45	47.2	62.3	56.6	55.4	88	38	69.2	44.9	40.9	48.0	45.6	44.8	79	61	68	70
O..	25.888	26.16	25.54	40.0	54.3	48.2	47.5	77	29	61.8	36.1	29.0	31.6	30.0	30.2	65	44	50	53
N..	25.742	26.13	25.35	34.9	43.3	39.1	39.1	61	20	47.5	30.4	25.0	28.2	28.2	27.1	67	56	65	63
D..	25.830	26.26	25.44	28.8	34.1	30.3	31.1	57	3	39.3	23.8	21.2	22.2	20.7	21.4	73	62	67	67
Y..	25.819	26.26	25.35	39.2	50.8	46.3	45.4	93	-15	56.5	35.8	30.2	33.1	33.1	32.1	71	53	62	62

Monthly and yearly meteorological summaries—Continued.

GRANT, FORT, ARIZ.
[H=4,856. h=1.]

Cloudiness (in tenths).				Wind.												Precipitation.		Number of days—									
7 a. m.	3 p. m.	11 p. m.	Mean.	Total (miles).	Maximum.	Direction.	North.	Northeast.	[illegible]	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Total.	Max. 24 hours.	Clear.	Fair.	Cloudy.	Rain or snow.	Max. below [illegible]	Min. below [illegible]	Max. above 90.°	Thunder-storms.	Auroras.	Months and year.
																In.	[illegible]										
2.5	3.3	0.9	2.2	4,723	[illegible]	[illegible]	15	14	13	17	16	6	6	9	0	0.31	0.22	21	9	1	4	0	14	0	0	0	J.
1.4	2.4	1.2	1.7	4,748	32	W.	17	8	7	10	8	7	18	9	0	1.02	0.74	23	2	3	3	0	6	0	1	0	F.
4.2	4.0	3.1	3.8	4,951	34	SE.	14	11	5	19	13	3	16	13	0	1.40	0.61	14	11	6	7	0	0	0	4	0	M.
1.2	3.0	2.1	2.1	5,268	28	W.	27	8	2	8	4	10	16	16	0	0.04	0.04	20	9	1	1	0	0	0	2	0	A.
0.8	3.0	2.2	2.0	5,246	42	[illegible]	20	8	3	7	12	11	12	20	0	0.25	0.21	23	7	1	3	0	0	3	3	0	M.
2.0	3.0	2.2	2.4	5,038	35	[illegible]	12	6	2	10	13	13	21	11	0	0.73	0.34	19	9	2	6	0	0	9	8	0	J.
2.2	3.7	5.1	3.7	4,647	36	W., SE.	10	6	2	9	15	7	18	25	1	0.93	0.36	13	14	4	11	0	0	20	18	0	J.
2.6	4.6	3.8	3.6	4,906	30	SE., S.	16	11	2	25	19	3	9	6	2	1.58	0.64	14	15	2	11	0	0	10	13	0	A.
1.0	2.2	1.9	1.7	4,974	37	[illegible]	24	11	0	24	8	8	9	6	0	0.81	0.48	23	7	0	7	0	0	3	6	0	S.
0.3	0.9	0.5	0.6	5,367	31	SE.	27	19	2	16	11	2	9	6	1	0.03	0.02	30	1	0	2	0	0	0	0	0	O.
2.7	3.2	2.2	2.7	4,759	29	SE.	27	6	1	19	4	7	16	11	0	1.30	0.58	19	7	4	6	0	0	0	2	0	N.
1.7	2.6	2.0	2.1	5,727	40	SE.	19	7	5	18	8	6	12	18	0	0.81	0.44	21	8	2	6	0	7	0	2	0	D.
1.9	3.0	2.3	2.4	60,440	.	....	228	117	44	182	130	82	158	150	4	9.21	0.74	240	99	26	68	0	27	45	59	0	Y.

GREENCASTLE, IND.
[H=897. h=69.]

HATTERAS, N. C.
[H=12. h=3.]

HELENA, MONT.
[H=4,069. h=57.]

Monthly and yearly meteorological summaries—Continued.

HURON, DAK.

[Latitude, 44° 21′ N.; longitude, 98° 9′ W. Local time, 1.32 slow, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a. m.	Temperature. 3 p. m.	Temperature. 11 p. m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew point. 7 a. m.	Dew point. 3 p. m.	Dew point. 11 p. m.	Dew point. Mean.	Relative humidity. 7 a. m.	Relative humidity. 3 p. m.	Relative humidity. 11 p. m.	Relative humidity. Mean.
	In.	*In.*	*In.*	°	°	°	°	°	°	°	°	°	°	°	°				
J..	28.690	29.28	28.16	0.3	9.5	1.4	3.7	40	−33	14.0	−6.3	−6.9	0.6	−6.9	−4.4	72	67	67	69
F..	28.629	29.06	28.10	1.5	13.4	6.6	7.2	50	−24	18.8	−2.6	−5.8	4.8	−0.5	−0.5	71	69	72	71
M.	28.676	29.06	28.26	23.5	38.0	28.5	30.0	68	−8	42.3	20.3	15.7	24.7	19.9	20.1	71	60	69	67
A..	28.560	28.97	27.95	36.2	56.4	45.1	45.9	75	18	59.7	34.4	28.8	39.1	36.0	34.6	74	54	71	66
M.	28.541	28.88	28.21	46.0	65.1	54.2	55.1	86	25	68.6	43.4	40.5	49.6	46.6	45.6	81	56	76	72
J..	28.587	28.93	28.01	58.0	73.8	65.3	65.7	89	38	77.8	55.3	54.0	62.1	60.2	58.8	87	67	84	79
J..	28.540	28.81	28.10	63.6	81.3	69.8	71.6	96	45	84.5	61.2	60.3	68.1	65.0	64.5	89	65	85	80
A..	28.619	28.92	28.26	56.8	72.4	62.9	64.0	89	47	75.5	55.4	53.7	58.5	57.4	56.5	89	63	88	79
S..	28.566	28.98	28.02	49.1	70.6	57.6	59.1	91	31	72.6	48.3	45.1	55.1	51.9	50.7	86	59	82	76
O..	28.616	28.91	28.31	33.7	55.7	40.3	43.2	82	21	58.9	30.9	28.2	36.9	33.9	33.0	80	52	78	70
N..	28.574	28.92	28.06	25.4	36.2	28.4	30.0	55	8	38.5	22.8	18.2	24.6	21.6	21.5	73	63	75	71
D..	28.620	29.10	28.00	18.6	30.5	21.7	23.6	59	−11	34.4	15.0	10.6	19.8	14.2	14.7	70	63	72	68
Y..	28.602	29.28	27.95	34.4	50.2	40.2	41.6	96	−33	53.8	31.5	28.5	37.0	33.3	32.9	79	62	76	72

INDIANAPOLIS, IND.

[Latitude, 39° 46′ N.; longitude, 86° 10′ W. Local time, 0.44 slow, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a. m.	Temperature. 3 p. m.	Temperature. 11 p. m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew point. 7 a. m.	Dew point. 3 p. m.	Dew point. 11 p. m.	Dew point. Mean.	Relative humidity. 7 a. m.	Relative humidity. 3 p. m.	Relative humidity. 11 p. m.	Relative humidity. Mean.
J..	29.316	29.89	28.50	19.0	25.8	22.8	22.5	52	−11	30.0	15.2	16.2	19.6	19.8	18.5	89	78	88	85
F..	29.186	29.73	28.58	15.4	25.7	20.3	20.5	59	−9	29.4	11.0	13.0	18.8	16.6	16.1	90	75	85	84
M.	29.265	29.62	28.78	28.3	38.2	32.4	33.0	64	3	40.7	25.8	22.8	24.6	24.6	24.0	79	59	78	71
A..	29.204	29.53	28.78	45.8	57.4	51.4	51.5	78	28	61.8	43.9	33.2	41.1	48.4	40.9	76	57	75	69
M.	29.129	29.41	28.73	54.0	68.6	58.8	60.5	88	35	71.4	51.1	47.0	47.5	48.6	47.7	79	49	70	66
J..	29.233	29.45	28.86	63.2	76.2	67.0	68.8	90	41	79.5	58.6	57.6	57.2	59.0	57.9	83	54	76	71
J..	29.194	29.39	29.00	69.6	84.9	74.3	76.3	94	47	86.8	66.0	64.6	64.5	66.0	65.0	85	52	76	71
A..	29.176	29.44	28.77	63.0	79.2	67.7	70.0	95	48	81.3	60.4	59.3	60.2	61.1	60.2	88	54	80	74
S..	29.245	29.49	28.76	56.9	73.1	61.7	63.9	84	38	74.8	54.7	52.8	53.7	54.9	53.8	86	58	79	73
O..	29.173	29.53	28.71	43.9	58.6	48.7	50.4	78	31	60.4	41.7	40.3	40.9	42.2	41.1	87	54	79	74
N..	29.171	29.54	28.88	38.1	46.5	41.0	41.9	70	24	48.5	34.9	32.7	34.2	33.5	33.5	81	64	76	74
D..	29.256	29.81	28.44	29.2	36.2	30.7	32.0	56	−2	39.8	24.6	24.6	25.4	24.3	24.8	84	66	77	76
Y..	29.212	29.89	28.44	43.9	55.9	48.1	49.3	95	−11	58.7	40.7	39.1	40.6	41.2	40.3	84	60	78	74

INDIANOLA, TEX.

[Latitude, 28° 32′ N.; longitude, 96° 31′ W. Local time, 1.26 slow, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a. m.	Temperature. 3 p. m.	Temperature. 11 p. m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew point. 7 a. m.	Dew point. 3 p. m.	Dew point. 11 p. m.	Dew point. Mean.	Relative humidity. 7 a. m.	Relative humidity. 3 p. m.	Relative humidity. 11 p. m.	Relative humidity. Mean.
J..	30.152	30.77	29.81	44.1	50.8	47.1	47.3	74	21	54.0	40.9	41.5	44.8	44.1	43.5	91	81	90	87
F..	30.041	30.42	29.62	47.9	55.6	51.6	51.7	73	25	58.8	44.8	44.3	46.5	46.8	45.9	88	73	86	82
M.	30.120	30.47	29.79	57.9	63.7	59.9	60.5	80	40	67.0	54.8	54.6	55.6	55.4	55.2	89	76	86	84
A..	29.957	30.27	29.70	68.6	75.5	70.8	71.5	86	50	78.2	66.1	65.7	66.3	66.6	66.2	91	74	88	84
M.	29.896	30.09	29.68	72.2	78.7	74.2	75.0	92	59	82.2	69.2	68.4	68.6	68.3	68.4	88	72	82	81
J..	29.991	30.13	29.78	78.4	88.3	80.0	82.2	95	72	90.8	76.8	74.0	73.9	73.6	73.8	87	63	81	77
J..	30.003	30.18	29.86	78.8	89.1	81.0	83.0	96	72	92.0	76.9	75.3	74.6	75.1	75.0	89	63	83	78
A..	29.950	30.09	29.83	78.8	88.5	81.2	82.8	95	72	90.5	77.0	76.5	75.0	75.5	75.8	90	65	88	79
S..	29.915	30.03	29.76	76.3	83.3	79.0	79.5	91	60	85.6	74.2	73.3	74.0	73.9	73.7	91	74	85	83
O..	30.020	30.38	29.83	65.3	74.7	69.3	69.8	85	48	76.6	63.3	59.7	60.2	61.6	60.5	88	62	77	74
N..	30.036	30.36	29.54	61.5	70.9	64.2	65.5	85	44	72.2	58.9	55.9	56.9	56.9	56.6	84	62	79	75
D..	30.142	30.53	29.44	54.9	62.6	57.9	58.5	77	31	65.3	51.7	50.2	52.3	51.6	51.4	86	72	82	80
Y..	30.019	30.77	29.44	65.4	73.5	68.0	69.0	96	21	76.2	62.8	61.5	62.4	62.4	62.1	88	70	85	80

JACKSONVILLE, FLA.

[Latitude, 30° 20′ N.; longitude, 81° 39′ W. Local time, 0.26 slow, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a. m.	Temperature. 3 p. m.	Temperature. 11 p. m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew point. 7 a. m.	Dew point. 3 p. m.	Dew point. 11 p. m.	Dew point. Mean.	Relative humidity. 7 a. m.	Relative humidity. 3 p. m.	Relative humidity. 11 p. m.	Relative humidity. Mean.
J..	30.140	30.48	29.79	52.2	61.8	55.2	56.2	78	31	64.0	49.4	47.6	49.7	50.3	49.2	85	68	84	79
F..	30.011	30.30	29.53	48.7	60.9	53.8	54.3	73	32	63.8	46.6	43.8	44.2	47.0	45.0	84	56	80	72
M.	30.079	30.44	29.73	51.6	64.7	56.5	57.6	79	33	68.3	50.1	46.7	47.3	50.7	48.2	84	55	82	74
A..	30.039	30.34	29.72	63.0	75.1	65.8	67.8	88	47	77.2	59.9	58.0	57.2	59.4	58.2	84	55	82	74
M.	29.982	30.09	29.67	70.6	79.6	70.9	73.7	89	55	83.1	66.6	65.0	64.9	66.1	65.3	83	66	85	77
J..	30.021	30.16	29.84	78.7	84.6	77.1	80.1	90	68	88.4	73.7	73.3	73.2	73.6	73.4	84	70	80	81
J..	30.014	30.19	29.79	79.7	88.5	79.0	82.4	95	71	91.3	75.8	73.6	72.7	73.3	73.2	82	60	83	75
A..	29.950	30.14	29.61	78.0	85.3	78.7	80.7	94	70	89.5	75.0	73.5	72.4	73.8	73.2	86	66	85	79
S..	29.948	30.09	29.72	74.8	83.1	76.9	78.3	92	68	85.8	73.2	72.3	72.6	73.3	72.7	92	72	89	85
O..	29.934	30.17	29.41	63.0	74.1	65.8	67.6	85	49	75.6	61.2	58.4	59.8	60.3	59.5	85	62	86	77
N..	30.014	30.28	29.64	53.5	68.7	58.6	60.3	81	36	69.9	52.1	49.0	51.9	53.0	51.3	85	56	83	75
D..	30.138	30.49	29.73	47.5	61.0	51.4	53.3	76	32	63.2	44.7	42.5	43.9	46.0	44.1	83	55	82	74
Y..	30.019	30.49	29.41	63.4	73.9	65.7	67.7	96	31	76.3	60.6	58.6	59.2	60.6	59.5	85	62	84	77

Monthly and yearly meteorological summaries—Continued.

HURON, DAK.
[$H=1,307.$ $h=36.$]

Cloudiness (in tenths).				Wind.												Precipitation.		Number of days—									
7 a. m.	3 p. m.	11 p. m.	Mean.	Total (miles).	Maximum.	Direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Total.	Max. 24 hours.	Clear.	Fair.	Cloudy.	Rain or snow.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder-storms.	Auroras.	Months and year.
																In.	In.										
2.2	4.9	2.1	3.7	6,545	37	S.	16	3	0	10	16	5	3	30	10	0.15	0.11	11	15	5	4	24	31	0	0	0	J.
2.9	5.2	3.9	4.3	4,465	28	NW.	12	5	2	7	15	2	6	30	8	0.22	0.17	12	8	8	6	21	28	0	0	1	F.
5.8	5.4	3.5	4.9	7,331	37	NW.	24	7	2	9	7	7	6	30	2	3.12	0.04	7	17	7	5	6	31	0	0	1	M.
4.7	5.0	3.7	4.6	8,198	39	SE.	16	6	6	24	14	4	1	14	3	1.06	0.54	11	13	6	10	0	12	0	4	1	A.
4.1	5.3	3.5	4.3	8,031	34	SW.	22	4	5	16	17	6	1	13	3	3.20	1.95	13	13	5	18	0	6	0	5	0	M.
5.0	4.9	4.9	4.9	6,209	42	SE.	14	3	7	29	16	6	6	8	7	5.43	1.10	8	17	5	13	0	0	0	10	2	J.
3.5	4.3	4.1	4.0	5,738	30	NW.	18	8	9	11	27	8	0	10	7	4.52	1.52	9	20	2	12	0	0	0	9	0	J.
5.6	5.2	4.0	4.9	4,969	26	S., NW	12	8	6	15	15	0	5	19	12	2.29	1.28	10	13	8	15	0	0	0	5	0	A.
2.8	3.0	2.4	2.6	5,782	31	SE.	6	6	4	21	7	5	9	16	6	2.61	1.26	14	11	5	7	0	1	1	3	1	S.
4.8	4.3	3.9	4.3	5,090	37	S.	7	4	2	22	5	8	6	34	5	0.98	0.66	14	9	8	5	0	19	0	0	0	O.
6.1	5.5	4.2	4.9	6,467	38	NE.	4	4	5	30	9	5	4	21	8	1.50	1.43	9	15	6	8	5	29	0	0	0	N.
4.3	4.8	3.7	4.8	6,884	30	NW.	6	2	4	20	14	4	4	27	12	0.10	0.06	11	13	7	2	12	28	0	0	0	D.
4.5	5.0	3.8	4.4	73,367	..	....	158	56	54	218	162	60	49	258	85	25.78	1.95	129	164	72	95	68	180	7	36	6	Y.

INDIANAPOLIS, IND.
[$H=766.$ $h=74.$]

INDIANOLA, TEX.
[$H=26.$ $h=40.$]

JACKSONVILLE, FLA.
[$H=43.$ $h=54.$]

Monthly and yearly meteorological summaries—Continued.

KEOKUK, IOWA.

[Latitude, 40° 22′; longitude, 91° 26′. Local time, 1.06 slow, Eastern.]

Months and year.	Pressure.			Temperature.						Mean.		Dew point.				Relative humidity.			
	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.
	In.	*In.*	*In.*	°	°	°	°	°	°	°	°	°	°	°	°				
J ..	29.499	30.03	28.64	11.3	21.1	16.3	16.2	51	-14	24.7	7.5	6.3	12.0	11.3	10.2	80	71	80	77
F ..	29.375	29.85	28.91	10.6	22.4	16.4	16.5	46	-14	25.9	7.8	5.9	14.9	11.9	10.9	81	73	82	78
M .	29.430	29.77	29.02	28.8	40.8	34.6	34.7	60	9	43.5	26.9	23.3	26.4	26.6	25.4	80	57	73	70
A ..	29.315	29.70	29.00	44.7	55.1	49.4	49.7	77	28	58.6	41.9	40.3	43.2	42.8	41.8	85	64	79	76
M .	29.267	29.53	28.92	54.1	68.2	59.5	60.6	84	32	70.3	50.9	47.4	50.7	50.6	49.6	79	55	73	69
J ..	29.359	29.63	29.00	65.4	76.7	68.1	70.1	89	49	79.0	61.5	59.8	61.6	62.4	61.3	82	61	82	75
J ..	29.314	29.55	29.08	72.3	86.4	76.8	78.5	99	58	87.9	69.3	67.1	68.5	69.5	68.4	83	56	78	72
A ..	29.326	29.65	29.08	63.8	77.4	68.9	70.0	98	49	81.4	61.4	59.9	60.7	61.6	60.7	87	58	78	74
S ..	29.354	29.60	28.85	58.6	71.6	63.7	64.6	84	46	73.7	56.5	54.4	55.8	56.7	55.6	86	59	79	75
O ..	29.326	29.65	28.92	42.8	57.2	48.2	49.4	77	30	59.7	41.0	39.1	42.5	40.2	40.6	87	61	75	74
N ..	29.316	29.67	28.73	35.2	46.2	40.3	40.6	73	22	50.7	32.6	30.7	34.6	33.0	32.8	84	66	77	76
D ..	29.413	29.90	28.67	24.2	33.5	28.4	28.7	55	- 5	36.7	19.9	20.2	24.8	23.7	22.9	84	72	[illegible]	80
Y ..	29.357	30.03	28.64	42.6	54.7	47.6	48.3	99	-14	57.7	39.8	37.9	41.3	40.9	40.0	83	63	78	75

KEELER, CAL.

[Latitude, 36° 35′ N.; longitude, 117° 50′ W. Local time, 2.51 slow, Eastern.]

J ..	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
F ..	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
M .	26.376	26.72	26.16	44.7	62.3	55.8	54.3	73	34	66.7	43.0	33.3	41.0	37.4	37.2	65	47	52	55
A ..	26.213	26.53	25.89	48.4	66.2	58.8	57.8	78	37	70.1	46.3	35.7	43.3	39.5	39.5	64	47	52	54
M .	26.188	26.37	25.96	57.3	77.0	69.8	68.0	96	42	80.2	55.6	41.4	49.8	44.3	45.2	56	39	41	45
J ..	26.219	26.44	25.99	58.6	79.3	71.2	69.7	94	46	83.0	57.2	39.1	46.0	41.6	42.2	49	32	36	39
J ..	26.266	26.45	26.09	68.6	90.0	81.8	80.1	105	61	93.8	66.7	49.4	58.5	53.0	53.6	51	35	38	41
A ..	26.272	26.44	26.05	72.0	87.5	83.4	81.0	103	62	93.5	68.9	51.6	56.4	51.2	53.1	51	37	35	41
S ..	26.255	26.44	26.00	66.3	79.1	77.0	74.1	97	50	87.1	62.1	39.0	45.1	39.8	41.3	38	31	28	32
O ..	26.335	26.53	26.14	57.2	69.1	66.8	64.4	90	47	77.0	58.9	36.2	40.9	36.4	37.8	47	33	35	40
N ..	26.296	26.62	25.85	46.9	56.1	52.1	51.7	79	36	61.0	43.2	35.1	36.9	33.5	35.2	65	50	52	56
D ..	26.417	26.73	26.06	41.0	49.6	45.6	45.4	63	31	54.3	37.5	30.2	33.5	30.5	31.4	66	56	57	60
Y ..	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......

KEY WEST, FLA.

[Latitude, 24° 34′ N.; longitude, 81° 49′ W. Local time, 0.37 slow, Eastern.]

J ..	30.117	30.28	29.92	69.8	75.0	70.8	71.9	82	59	76.9	68.2	66.0	67.0	66.4	66.5	88	76	87	84
F ..	30.035	30.27	29.81	66.5	70.7	67.4	68.2	82	56	73.2	63.8	61.0	61.8	61.0	61.3	88	74	81	79
M .	30.097	30.33	29.91	68.6	74.7	69.2	70.8	85	61	76.4	66.7	63.1	63.7	63.9	63.6	83	69	84	79
A ..	30.029	30.18	29.92	74.8	79.4	73.8	76.0	86	67	81.8	71.9	66.9	67.4	66.8	67.0	77	67	79	74
M .	29.961	30.16	29.82	79.4	84.1	77.6	80.4	91	70	86.3	75.6	72.3	71.9	71.9	72.0	79	67	83	76
J ..	30.051	30.18	29.82	82.0	86.0	79.9	82.6	93	72	88.4	77.6	74.5	74.4	73.8	74.2	79	69	82	77
J ..	30.068	30.19	29.96	83.9	88.5	82.3	84.9	98	73	91.4	79.5	74.7	75.1	74.7	74.8	74	65	78	72
A ..	30.007	30.12	29.92	83.9	88.6	82.7	85.1	94	75	91.3	79.7	76.6	76.7	76.2	76.5	79	68	81	76
S ..	29.962	30.09	29.80	82.2	87.9	81.9	84.0	92	72	89.8	79.0	77.4	78.4	77.0	77.6	86	74	85	82
O ..	29.943	30.11	29.70	76.6	80.2	76.5	77.8	87	69	82.0	74.4	69.8	70.4	69.3	69.8	80	73	79	77
N ..	30.027	30.21	29.88	69.6	74.3	71.0	76.1	84	56	76.1	68.1	64.5	64.9	65.0	64.8	84	73	82	80
D ..	30.120	30.35	29.93	63.3	66.7	64.0	64.7	83	50	69.2	61.1	58.4	59.3	59.0	58.9	84	78	84	82
Y ..	30.035	30.35	29.70	75.0	79.7	74.8	76.5	94	50	81.9	72.1	68.8	69.2	68.8	68.9	81	71	82	78

KITTY HAWK, N. C.

[Latitude, 36° N.; longitude, 75° 42′ W. Local time, 0.03 slow, Eastern.]

J ..	30.170	30.74	29.63	43.5	47.2	45.4	45.4	72	22	53.4	37.4	38.8	38.7	38.9	38.8	84	74	79	79
F ..	29.995	30.50	29.28	36.9	44.1	38.9	39.0	64	15	46.2	31.2	31.3	30.7	32.3	31.4	80	68	77	75
M .	30.070	30.54	29.57	38.2	45.6	41.3	41.7	68	22	49.9	35.1	33.1	35.0	35.8	34.5	82	68	80	77
A ..	30.065	30.56	29.56	51.4	58.3	53.3	54.3	80	35	62.7	46.8	46.6	48.6	48.4	47.9	84	72	84	80
M .	29.947	30.21	29.50	61.7	66.8	62.2	63.6	87	46	71.1	57.5	58.6	61.2	59.3	59.7	90	83	90	88
J ..	30.056	30.30	29.67	70.5	76.8	69.9	72.4	96	56	81.1	66.6	65.7	66.5	65.4	65.9	85	73	80	81
J ..	30.007	30.24	29.72	77.2	87.0	76.6	80.3	98	60	89.7	73.0	71.5	72.6	71.8	72.0	88	68	85	77
A ..	29.996	30.23	29.64	75.7	81.8	75.8	77.8	95	63	84.6	73.0	70.9	71.8	71.3	71.3	85	73	87	82
S ..	30.074	30.34	28.44	68.8	74.3	69.0	70.7	91	52	76.2	65.7	64.4	64.4	65.0	64.6	86	72	87	82
O ..	30.005	30.34	29.30	60.8	65.9	61.2	62.6	84	45	67.8	57.4	55.3	56.3	55.7	55.8	83	72	83	79
N ..	30.000	30.39	29.60	48.5	55.8	51.6	52.0	75	36	59.1	45.7	43.2	43.2	44.1	43.5	82	65	76	74
D ..	30.077	30.72	29.40	42.9	48.7	44.5	45.4	68	25	53.1	37.3	36.2	33.9	35.0	35.0	78	62	71	70
Y ..	30.038	30.74	29.28	56.3	62.4	57.5	58.7	98	15	66.2	52.2	51.3	51.9	51.9	51.7	84	70	82	79

Monthly and yearly meteorological summaries—Continued.

KEOKUK, IOWA.
[$H=616.$ $h=60.$]

Cloudiness (in tenths).				Wind.													Precipitation.		Number of days—									
7 a. m.	3 p. m.	11 p. m.	Mean.	Total (miles).	Maximum.	Direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Total.	Max. 24 hours.	Clear.	Fair.	Cloudy.	Rain or snow.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunderstorms.	Auroras.	Months and year.
																In.	In.										
4.6	5.0	4.5	4.7	6,501	24	SW.	4	5	6	6	15	16	8	29	1	2.44	0.55	12	11	7	10	18	29	0	0	0	J.
2.5	4.4	2.6	3.8	5,504	27	NW.	14	5	9	4	6	16	16	15	0	1.14	0.47	13	11	4	8	16	26	0	0	0	F.
2.4	4.3	3.6	3.8	7,859	28	NW.	14	8	6	5	2	17	19	21	1	0.17	0.09	11	16	3	4	5	22	0	0	1	M.
6.3	7.1	6.0	6.5	7,308	31	SE.	12	7	14	16	16	4	7	13	0	3.83	0.83	4	14	12	18	0	3	0	8	0	A.
3.9	5.6	3.7	4.4	6,201	28	W.	6	11	12	12	11	8	9	20	4	2.59	1.05	10	17	4	8	0	0	0	4	0	M.
4.9	5.9	4.1	5.0	5,200	36	SW.	13	5	12	13	17	13	4	8	5	6.97	2.17	5	22	3	14	0	0	0	8	0	J.
3.8	5.0	3.6	4.1	4,832	26	S.	7	4	9	8	26	22	8	6	3	2.29	0.82	13	14	4	7	0	0	11	6	0	J.
3.7	5.9	4.6	4.4	5,160	20	S.	17	4	13	11	16	10	8	11	3	5.96	2.48	10	17	4	8	0	0	8	4	0	A.
4.5	4.5	4.3	4.4	5,153	27	S.	8	11	9	8	22	16	4	7	3	3.77	1.57	13	8	9	11	0	0	0	3	1	S.
4.0	4.4	3.7	4.0	5,654	22	NW.	20	8	6	10	14	10	7	16	5	2.69	1.76	15	7	9	10	0	3	0	2	0	O.
4.8	5.8	4.2	4.9	6,195	22	SW.	7	7	13	6	12	9	10	21	5	0.88	0.77	13	7	10	8	0	13	0	0	0	N.
3.6	5.1	4.7	4.5	6,448	38	NW.	7	2	8	8	16	17	14	22	0	1.96	0.84	10	15	6	12	10	25	0	0	0	D.
4.2	5.2	4.2	4.5	71,636	...	....	130	74	117	107	171	162	114	189	30	35.11	2.48	129	161	74	109	49	121	14	30	2	Y.

KEELER, CAL.
[$H=3,622.$ $h=2.$]

KEY WEST, FLA.
[$H=20.$ $h=42.$]

KITTY HAWK, N. C.
[$H=9.$ $h=2.$]

Monthly and yearly meteorological summaries—Continued.

KNOXVILLE, TENN.

[Latitude, 35° 56′ N.; longitude, 83° 58′ W. Local time, 0.36 slow, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a.m.	Temperature. 3 p.m.	Temperature. 11 p.m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew point. 7 a.m.	Dew point. 3 p.m.	Dew point. 11 p.m.	Dew point. Mean.	Relative humidity. 7 a.m.	Relative humidity. 3 p.m.	Relative humidity. 11 p.m.	Relative humidity. Mean.
	In.	*In.*	*In.*	°	°	°	°	°	°	°	°	°	°	°	°				
J..	29.149	29.57	28.54	30.3	39.8	34.5	34.9	59	8	44.2	26.8	24.8	28.3	27.4	26.2	80	61	70	73
F..	28.994	29.40	28.36	27.8	39.9	34.2	34.0	60	1	43.9	24.7	22.5	27.1	25.2	24.9	81	64	71	72
M.	29.065	29.42	28.73	36.3	48.7	41.6	42.2	70	17	53.1	32.1	30.1	32.2	31.4	31.2	79	56	68	67
A..	29.086	29.44	28.71	49.3	66.4	56.8	57.5	84	29	69.3	46.9	43.3	42.9	45.3	43.8	80	45	67	64
M.	28.960	29.21	28.53	57.0	72.6	61.7	63.8	85	39	74.9	55.0	52.4	50.8	54.2	52.5	84	49	78	70
J..	29.053	29.24	28.80	68.4	82.6	71.4	74.1	91	57	84.4	65.6	63.9	63.0	64.4	63.8	86	53	79	73
J..	29.028	29.23	28.82	69.9	85.6	74.3	76.6	94	52	87.3	67.5	66.8	65.4	66.4	66.9	90	52	83	75
A..	29.000	29.17	28.73	69.0	82.9	72.6	74.8	93	56	85.1	67.2	65.7	65.7	67.4	66.3	90	58	84	77
S..	29.053	29.26	28.79	62.1	77.7	66.8	68.9	88	45	79.5	60.6	57.7	58.4	59.5	58.5	86	53	78	72
O..	29.001	29.26	28.47	46.6	62.7	51.6	53.6	76	32	65.1	44.2	44.1	46.7	46.5	45.8	91	58	83	77
N..	29.019	29.32	28.62	40.7	53.7	45.8	46.7	78	29	55.8	39.1	36.8	39.2	40.0	38.7	86	60	81	76
D..	29.122	29.55	28.48	33.6	46.8	38.5	39.6	66	19	49.8	30.9	29.3	29.7	30.7	29.9	84	55	75	71
Y..	29.039	29.57	28.36	49.2	63.3	54.2	55.6	94	1	66.0	46.7	44.8	45.6	46.7	45.7	85	55	77	72

LA CROSSE, WIS.

[Latitude, 43° 49′ N.; longitude, 91° 15′ W. Local time, 1.05 slow, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a.m.	Temperature. 3 p.m.	Temperature. 11 p.m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew point. 7 a.m.	Dew point. 3 p.m.	Dew point. 11 p.m.	Dew point. Mean.	Relative humidity. 7 a.m.	Relative humidity. 3 p.m.	Relative humidity. 11 p.m.	Relative humidity. Mean.
J..	29.314	29.90	28.55	2.7	12.8	9.6	8.4	44	-25	17.0	-0.4	-6.4	1.7	0.2	-1.5	66	62	67	65
F..	29.214	29.72	28.64	4.4	16.7	13.3	11.5	43	-22	19.9	2.7	-1.7	6.7	6.0	3.7	75	65	72	71
M.	29.253	29.63	28.66	22.2	32.2	29.5	28.0	53	- 2	30.4	20.7	15.3	21.6	22.4	19.8	74	65	75	71
A..	29.292	29.54	28.77	41.3	50.3	45.5	45.7	74	22	52.9	38.8	34.0	34.1	37.3	35.1	76	56	74	68
M.	29.120	29.42	28.73	52.0	64.0	57.3	57.8	86	29	66.9	49.1	41.6	41.9	44.7	42.7	68	47	64	60
J..	29.204	29.52	28.82	62.0	73.0	66.1	67.0	86	42	75.6	58.6	55.8	56.9	58.6	57.1	80	59	77	72
J..	29.147	29.41	28.82	68.7	80.6	72.5	73.9	92	56	82.5	66.0	62.9	66.2	66.3	65.1	82	62	80	75
A..	29.192	29.57	28.85	60.6	71.9	65.0	65.8	83	44	73.4	58.9	56.7	58.4	58.6	57.6	84	64	80	76
S..	29.295	29.47	28.63	54.9	66.7	60.5	61.4	84	43	70.0	53.7	50.1	53.4	53.8	52.4	84	60	79	74
O..	29.199	29.51	28.90	40.8	53.1	46.3	46.7	73	28	54.9	39.8	35.1	38.6	37.8	37.2	80	59	72	70
N..	29.166	29.54	28.62	34.5	41.5	37.9	38.0	58	21	44.0	32.6	28.7	33.3	31.4	30.8	79	76	77	76
D..	29.235	29.80	28.51	22.5	29.6	26.8	26.3	58	- 9	33.3	19.8	16.7	22.1	19.8	19.5	78	73	75	75
Y..	29.205	29.90	28.51	38.9	49.5	44.2	44.2	92	-25	52.2	36.7	32.3	36.2	34.4	35.0	77	62	74	71

LAMAR, MO.

[Latitude, 37° 32′ N.; longitude, 94° 15′ W. Local time, 1.17 slow, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a.m.	Temperature. 3 p.m.	Temperature. 11 p.m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew point. 7 a.m.	Dew point. 3 p.m.	Dew point. 11 p.m.	Dew point. Mean.	Relative humidity. 7 a.m.	Relative humidity. 3 p.m.	Relative humidity. 11 p.m.	Relative humidity. Mean.
J..	......	......	......	......	......	......	......	...	...	......	......	......	......	......	......	...	...	...	...
F..	......	......	......	......	......	......	......	...	...	......	......	......	......	......	......	...	...	...	...
M.	29.063	29.38	28.71	34.0	47.4	41.0	40.8	78	16	52.6	31.4	28.9	29.1	31.6	29.9	82	52	71	68
A..	28.915	29.31	28.54	49.3	62.5	54.3	55.4	79	31	66.8	45.9	43.5	43.4	44.5	43.8	82	54	71	69
M.	28.889	29.18	28.54	55.1	69.3	61.7	62.0	85	38	72.5	53.1	50.2	50.8	52.8	51.3	84	58	74	70
J..	28.945	29.17	28.68	66.7	78.8	70.4	72.0	90	53	81.6	64.2	63.1	65.2	65.0	64.4	88	64	82	78
J..	28.942	29.11	28.77	71.0	84.8	74.6	76.8	99	58	88.0	69.3	68.2	67.9	69.6	68.6	91	58	85	78
A..	28.934	29.13	28.72	66.5	82.0	71.7	73.4	94	52	84.6	65.6	63.1	65.0	66.5	64.9	89	58	84	77
S..	28.951	29.20	28.65	59.7	74.5	64.7	66.3	86	50	77.2	58.0	57.5	58.6	60.5	58.9	92	60	86	80
O.	28.985	29.28	28.63	45.2	63.7	51.3	53.4	83	29	66.6	43.1	40.8	41.0	42.8	41.5	85	46	73	68
N..	28.917	29.27	28.39	40.6	55.2	45.7	47.2	80	22	59.3	36.7	34.0	32.3	34.9	33.7	78	46	67	64
D..	29.026	29.41	28.27	31.3	42.7	34.8	36.3	64	-4	46.1	26.4	26.0	27.7	26.7	26.8	82	59	75	72
Y..	......	......	......	......	......	......	......	...	...	......	......	......	......	......	......	...	...	...	...

LEAVENWORTH, KANS.

[Latitude, 39° 19′ N.; longitude, 94° 57′ W. Local time, 1.20 slow, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a.m.	Temperature. 3 p.m.	Temperature. 11 p.m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew point. 7 a.m.	Dew point. 3 p.m.	Dew point. 11 p.m.	Dew point. Mean.	Relative humidity. 7 a.m.	Relative humidity. 3 p.m.	Relative humidity. 11 p.m.	Relative humidity. Mean.
J..	29.294	29.81	28.55	13.3	24.9	18.8	19.0	56	-11	29.5	9.4	11.8	17.8	15.4	15.0	94	75	89	86
F..	29.181	29.60	28.63	15.7	27.6	21.4	21.6	57	-10	32.4	12.8	12.4	18.7	16.7	15.9	87	70	82	80
M.	29.241	29.59	28.81	32.4	48.2	39.6	40.1	70	15	51.8	30.5	28.8	30.6	32.5	30.5	84	52	76	71
A..	29.112	29.53	28.75	47.4	58.5	52.3	52.7	77	30	62.7	44.9	42.8	45.0	44.8	42.2	85	63	76	75
M.	29.067	29.39	28.76	54.8	69.9	60.6	61.8	88	36	72.5	52.7	49.3	51.0	52.6	51.0	82	53	75	70
J..	29.109	29.38	28.76	66.7	79.0	70.9	72.2	96	51	82.5	63.9	61.1	64.8	64.5	63.5	88	63	81	75
J..	29.087	29.29	28.86	71.6	86.3	75.5	77.9	98	59	88.8	68.8	66.5	70.6	69.7	68.9	84	66	82	75
A..	29.101	29.38	28.82	66.7	81.4	72.4	73.5	97	52	84.8	63.9	61.6	65.6	65.5	64.2	84	59	79	74
S..	29.122	29.43	28.74	59.2	73.8	65.2	66.1	85	46	75.5	56.0	55.2	57.3	58.7	57.1	87	59	80	75
O..	29.121	29.45	28.83	44.7	61.3	50.8	52.3	77	30	64.4	42.7	42.0	41.9	42.2	41.0	81	53	74	69
N..	29.100	29.47	28.44	37.6	50.9	41.9	43.5	75	26	53.8	34.0	31.2	33.5	33.3	32.7	78	53	72	68
D..	29.210	29.61	28.63	27.4	38.2	32.9	32.8	57	2	41.2	24.3	22.4	27.0	27.1	25.5	81	65	79	75
Y..	29.145	29.82	28.44	44.8	58.3	50.2	51.1	98	-16	61.6	42.0	40.1	43.6	43.6	42.5	84	60	78	74

Monthly and yearly meteorological summaries—Continued.

KNOXVILLE, TENN.

[*H*=960. *h*=77.]

Cloudiness (in tenths).				Wind.												Precipitation.		Number of days—									
7 a. m.	3 p. m.	11 p. m.	Mean.	Total (miles).	Maximum.	Direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Total.	Max. 24 hours.	Clear.	Fair.	Cloudy.	Rain or snow.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder-storms.	Auroras.	Months and year.
																In.	In.										
6.0	6.3	4.1	5.4	5,617	26	W.	20	28	2	2	6	7	23	5	1	7.64	1.53	9	11	11	15	2	18	0	1	0	J.
5.3	5.6	4.2	5.0	4,706	32	W.	18	6	4	0	1	21	21	4	8	2.97	0.99	10	7	10	12	3	16	0	0	0	F.
4.9	5.3	3.7	4.6	4,173	21	W.	14	11	1	1	1	14	22	11	17	3.10	1.29	11	11	9	9	6	13	0	2	0	M.
4.9	4.5	2.5	4.0	4,546	27	SW.	12	9	16	2	5	14	24	8	7	1.93	0.79	14	11	5	7	0	2	0	2	0	A.
5.0	5.5	4.4	5.0	3,694	23	NW.	16	8	7	1	8	15	13	11	14	7.19	1.48	11	9	11	13	0	0	0	12	0	M.
4.8	5.6	3.8	4.7	3,370	25	NW.	16	10	9	3	6	17	13	3	12	3.15	1.57	9	14	6	5	0	0	2	9	0	J.
3.8	4.5	2.9	3.8	2,834	30	N.	17	15	4	3	4	20	10	6	14	4.00	2.85	12	17	2	10	0	0	11	16	0	J.
5.0	5.7	4.3	5.0	3,281	24	NE.	12	13	5	4	8	29	11	3	13	4.05	1.24	11	13	7	13	0	0	4	7	0	A.
6.1	7.0	4.8	6.0	3,621	27	W.	16	21	24	1	1	8	17	2	2	2.21	0.93	7	11	12	13	0	0	0	1	0	S.
3.8	5.9	4.4	5.4	3,570	27	W.	12	23	8	0	7	9	28	5	3	7.86	3.08	11	9	11	9	0	0	0	2	0	O.
6.1	6.7	5.2	6.0	3,548	21	W., SW	19	9	8	4	2	14	22	10	2	6.15	2.14	8	9	13	11	0	5	0	3	0	N.
7.0	5.3	4.0	5.4	4,980	23	W.	11	10	6	5	3	8	37	10	4	4.45	2.00	6	16	9	12	0	17	0	0	0	D.
5.4	5.6	4.0	5.0	47,830	...	....	181	165	88	25	46	176	240	78	95	54.70	3.08	119	138	106	138	6	73	17	55	0	Y.

LA CROSSE, WIS.

[*H*=725. *h*=67.]

LAMAR, MO.

[*H*=1,026. *h*=51.]

LEAVENWORTH, KANS.

[*H*=862. *h*=48.]

Monthly and yearly meteorological summaries—Continued.

LEWISTON, IDAHO.

[Latitude, 46° 8′ N.; longitude, 117° 5′ W. Local time, 2.48 slow, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a.m.	Temperature. 3 p.m.	Temperature. 11 p.m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew point. 7 a.m.	Dew point. 3 p.m.	Dew point. 11 p.m.	Dew point. Mean.	Relative humidity. 7 a.m.	Relative humidity. 3 p.m.	Relative humidity. 11 p.m.	Relative humidity. Mean.
	In.	In.	In.	°	°	°	°	°	°	°	°	°	°	°	°				
J..	29.375	29.86	28.80	20.4	26.4	23.8	23.5	56	-10	31.3	16.6	15.2	20.1	19.8	18.2	80	77	83	80
F..	29.257	29.71	28.85	35.8	43.1	39.4	39.4	58	23	47.1	33.1	30.4	32.9	32.7	32.0	81	69	78	76
M.	29.357	29.64	29.00	39.0	53.9	50.9	47.9	72	30	62.3	37.1	33.4	36.3	38.4	36.0	80	53	64	66
A..	29.155	29.45	28.78	43.6	62.0	57.4	54.3	81	31	69.4	40.8	36.6	33.4	36.2	35.4	77	36	48	53
M..	29.109	29.38	28.71	52.2	66.2	62.8	60.4	87	42	73.8	49.4	44.7	45.6	46.8	45.7	76	50	59	62
J..	29.121	29.39	28.94	57.2	71.4	68.8	65.8	91	47	77.8	55.1	51.7	52.7	54.9	53.1	82	53	64	67
J..	29.108	29.32	28.82	63.8	81.3	79.5	74.9	99	53	87.9	61.0	55.0	51.0	51.8	52.6	73	36	40	50
A..	29.136	29.41	28.94	60.0	79.6	77.3	72.3	105	51	88.2	58.1	50.2	47.3	45.6	47.7	71	34	35	46
S...	29.133	29.48	28.78	53.9	69.5	65.9	63.1	90	41	76.4	52.0	46.5	46.9	46.7	46.7	76	46	52	58
O..	29.256	29.49	28.86	42.1	58.5	52.7	51.1	79	31	65.6	40.5	37.6	40.8	39.9	39.4	84	58	63	67
N..	29.118	29.59	28.70	40.6	49.3	46.0	45.3	62	29	52.8	39.0	36.6	39.7	38.9	38.4	86	71	78	78
D..	29.309	29.84	28.90	37.2	42.6	39.7	39.8	61	16	46.3	34.0	33.0	34.9	35.0	34.8	85	75	84	81
Y..	29.202	29.86	28.70	45.5	58.6	55.4	53.2	105	-10	64.9	43.1	39.2	40.1	40.5	39.9	79	54	62	65

LITTLE ROCK, ARK.

[Latitude, 34° 45′ N.; longitude, 92° 6′ W. Local time, 1.08 slow, Eastern.]

J..	29.876	30.37	29.12	32.8	41.6	38.0	37.5	60	10	45.4	29.9	28.3	31.5	31.5	30.4	84	68	78	77
F...	29.746	30.10	29.30	35.8	46.6	42.5	41.6	72	10	52.6	31.4	31.3	33.8	34.9	33.3	84	62	76	74
M..	29.823	30.22	29.49	44.5	57.5	51.3	51.1	77	27	62.7	40.5	39.2	40.8	43.3	41.1	82	56	75	71
A..	29.677	30.08	29.34	58.1	69.6	64.2	64.0	86	40	73.8	53.8	50.8	51.4	53.5	51.9	77	56	71	68
M..	29.617	29.89	29.23	62.0	74.3	67.9	68.1	89	44	78.0	59.8	56.9	55.6	59.4	57.3	84	54	75	71
J..	29.690	29.84	29.45	73.0	86.0	77.7	78.9	95	66	89.1	71.8	68.6	70.1	71.2	70.0	87	61	81	76
J..	29.680	29.86	29.52	76.0	90.5	81.9	82.8	100	65	94.2	75.4	71.9	71.1	73.8	72.3	87	53	77	73
A..	29.656	29.82	29.40	73.0	87.6	79.0	79.9	99	64	91.0	72.5	69.6	74.8	72.3	72.2	89	66	80	79
S..	29.670	29.88	29.47	67.7	80.1	72.7	73.5	90	56	83.1	67.0	64.3	66.8	67.6	66.2	89	65	85	80
O..	29.690	30.07	29.41	53.1	67.5	59.3	60.0	83	39	70.8	51.6	48.6	49.6	51.2	49.8	85	54	75	72
N..	29.711	30.08	29.26	44.7	59.8	51.4	52.0	79	28	63.0	42.3	40.0	38.0	40.2	39.4	85	51	68	68
D..	29.837	30.24	29.01	37.2	49.6	42.2	43.0	71	19	52.6	34.5	30.4	32.6	31.6	31.5	77	55	69	67
Y..	29.723	30.37	29.01	54.8	67.6	60.7	61.0	100	10	71.4	52.6	50.0	51.3	52.5	51.3	84	58	76	73

LOS ANGELES, CAL.

[Latitude, 34° 3′ N.; longitude, 118° 15′ W. Local time, 2.53 slow, Eastern.]

J..	29.750	30.01	29.46	47.1	62.5	52.1	53.9	72	38	65.3	44.1	36.9	40.9	44.6	40.8	70	48	77	65
F..	29.687	29.91	29.39	48.2	67.0	54.6	56.6	81	36	69.7	44.4	39.8	43.6	46.6	43.3	75	47	77	66
M.	29.696	29.94	29.53	51.8	71.6	58.3	60.6	85	42	74.1	49.3	43.5	45.8	49.7	46.3	77	44	76	66
A..	29.623	29.83	29.42	54.8	71.6	59.7	61.9	89	45	74.2	52.5	49.0	50.5	51.5	50.3	83	49	76	70
M.	29.561	29.67	29.44	56.3	73.6	60.7	63.5	80	49	76.5	54.7	53.0	55.5	55.5	54.7	89	54	83	75
J..	29.622	29.74	29.49	55.0	77.9	62.2	65.0	90	47	80.8	53.6	50.4	54.4	54.5	53.1	85	45	77	69
J..	29.601	29.74	29.47	60.4	83.4	66.2	70.0	98	52	85.8	58.6	56.2	60.8	59.8	58.9	86	48	79	71
A..	29.540	29.67	29.39	63.4	86.5	68.2	72.7	106	51	89.4	61.4	58.3	62.0	61.2	60.5	84	46	79	70
S..	29.472	29.63	29.33	59.5	82.8	66.1	60.5	108	51	84.9	56.6	55.5	62.5	61.6	59.9	88	52	87	76
O..	29.590	29.75	29.44	54.5	77.7	62.3	64.8	102	41	79.4	52.3	50.5	60.2	59.4	56.7	87	56	91	78
N..	29.647	29.83	29.35	53.1	67.5	57.8	59.5	78	40	69.1	50.5	47.9	53.5	53.3	51.6	84	63	86	78
D..	29.723	29.93	29.48	52.3	65.9	55.4	57.9	82	40	68.2	48.6	48.7	50.3	48.8	47.6	75	59	80	72
Y..	29.626	30.01	29.33	54.7	74.0	60.3	63.0	108	36	76.4	52.2	48.7	53.3	53.9	52.0	82	51	81	71

LOUISVILLE, KY.

[Latitude, 38° 15′ N.; longitude, 85° 45′ W. Local time, 0.43 slow, Eastern.]

J..	29.594	30.14	28.83	28.1	35.0	31.0	31.4	61	- 5	38.8	22.8	22.1	26.9	24.8	24.6	78	72	78	76
F..	29.453	29.97	28.80	25.2	35.0	29.5	29.9	68	- 1	38.8	20.4	19.5	25.4	22.1	22.8	78	69	75	74
M.	29.525	29.90	29.11	34.5	44.2	40.1	39.6	75	12	47.9	31.4	27.5	30.6	30.8	29.6	75	62	70	69
A..	29.441	29.79	29.02	51.2	64.3	57.6	57.7	83	31	68.3	48.0	44.0	46.8	48.2	46.3	77	55	71	68
M.	29.366	29.64	28.92	59.2	71.9	64.6	65.2	87	39	74.7	54.9	52.5	53.0	55.6	53.7	79	53	74	69
J..	29.466	29.69	29.17	67.9	80.6	72.3	73.6	94	50	83.4	62.4	62.5	63.1	64.4	63.3	82	56	77	72
J..	29.482	29.61	29.23	73.7	87.6	78.2	79.8	97	54	90.0	67.6	67.0	66.4	69.1	67.5	80	50	74	68
A..	29.402	29.63	29.05	69.8	83.5	73.5	75.6	97	52	85.9	67.1	64.4	63.7	65.6	64.6	83	52	76	71
S..	29.476	29.68	29.08	61.9	75.8	66.9	68.2	86	45	77.5	60.3	57.5	58.3	59.8	58.5	86	56	78	74
O..	29.415	29.75	28.98	50.9	62.0	54.9	55.9	79	40	64.9	48.5	46.3	47.3	48.2	47.8	85	60	78	74
N..	29.426	29.77	29.04	45.0	58.2	48.0	48.7	73	34	56.3	42.2	38.8	38.6	39.0	38.8	79	59	72	70
D..	29.584	30.04	28.77	37.8	45.0	40.1	41.0	67	9	49.5	33.4	30.7	32.8	32.2	31.9	77	64	74	72
Y..	29.461	30.14	28.77	50.4	61.5	54.7	55.5	97	- 5	64.7	46.6	44.4	46.1	46.6	45.7	80	59	75	71

Monthly and yearly meteorological summaries—Continued.

LEWISTON, IDAHO.

[H=785. h=48.]

Cloudiness (in tenths). 7 a.m.	3 p.m.	11 p.m.	Mean.	Wind. Total (miles).	Maximum.	Direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Precipitation. Total.	Max. 24 hours.	Number of days— Clear.	Fair.	Cloudy.	Rain or snow.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder-storms.	Auroras.	Months and year.
																In.	*In.*										
6.2	6.5	4.9	5.9	689	30	NE.	0	11	1	5	0	4	0	1	71	1.67	0.60	7	12	12	11	10	25	0	0	0	J.
5.9	6.4	4.6	5.6	1,051	39	NW.	0	15	1	7	0	2	0	2	56	2.88	0.96	4	17	7	11	0	12	0	0	0	F.
2.0	2.5	1.4	2.0	1,616	29	NW.	0	18	3	19	1	9	1	11	31	0.53	0.46	24	5	2	3	0	3	0	0	1	M.
2.1	2.7	1.6	2.1	1,980	25	NW.	1	12	0	5	1	9	3	15	42	0.19	0.11	20	10	0	2	0	1	0	0	0	A.
4.9	4.8	4.4	4.5	973	22	NE.	0	14	2	11	0	4	0	8	54	3.02	0.78	12	12	7	11	0	0	0	0	0	M.
4.4	4.9	5.5	4.7	689	25	NW.	0	2	2	11	0	5	1	7	62	4.91	1.72	10	15	5	13	0	0	2	3	0	J.
2.2	2.2	2.8	2.4	1,219	28	NW.	0	10	0	7	0	4	0	26	46	2.12	0.08	21	8	2	2	0	0	11	1	0	J.
1.5	1.4	1.5	1.6	1,044	32	NW.	1	17	3	13	1	8	1	18	34	0.41	0.17	24	7	0	5	0	0	10	1	0	A.
3.8	3.0	1.7	2.8	2,188	26	SW., NW.	0	15	3	24	0	12	1	6	27	0.08	0.24	19	8	3	4	0	0	0	0	0	S.
3.5	2.2	1.8	2.8	1,333	19	NW.	0	18	0	27	0	12	0	6	31	0.71	0.37	20	7	4	3	0	1	0	0	0	O.
7.3	6.1	5.6	6.3	2,010	20	NW.	0	29	1	25	2	7	0	6	11	2.13	0.69	4	16	10	14	0	2	0	0	0	N.
8.6	5.9	5.2	6.6	2,624	26	NW.	0	34	0	19	0	23	0	7	11	2.21	0.55	2	17	12	16	1	10	0	0	0	D.
4.2	4.1	3.4	3.9	17,885	..	....	2	206	16	173	5	90	7	110	477	19.44	1.72	167	134	64	96	20	64	23	7	1	Y.

LITTLE ROCK, ARK.

[H=288. h=68.]

LOS ANGELES, CAL.

[H=290. h=107.]

LOUISVILLE, KY.

[H=551. h=102.]

Monthly and yearly meteorological summaries—Continued.

LYNCHBURG, VA.

[Latitude, 37° 25′ N.; longitude, 79° 9′ W. Local time, 0.16 slow, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a.m.	Temperature. 3 p.m.	Temperature. 11 p.m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew point. 7 a.m.	Dew point. 3 p.m.	Dew point. 11 p.m.	Dew point. Mean.	Relative humidity. 7 a.m.	Relative humidity. 3 p.m.	Relative humidity. 11 p.m.	Relative humidity. Mean.
	In.	In.	In.	°	°	°	°	°	°	°	°	°	°	°	°				
J..	29.445	30.09	28.84	32.1	39.8	34.4	35.4	65	12	44.3	27.8	26.8	28.1	27.6	27.5	80	64	76	73
F..	29.285	29.79	28.61	26.8	37.7	30.4	31.6	61	4	40.8	23.8	19.6	23.7	23.1	22.1	74	56	74	68
M..	29.349	29.76	28.93	32.9	46.3	37.9	39.0	71	17	48.4	30.9	25.3	27.1	29.0	27.1	74	49	71	65
A..	29.357	29.90	28.93	48.6	64.9	53.4	55.0	85	32	67.2	43.9	39.5	39.1	41.8	40.1	77	42	66	62
M..	29.265	29.40	28.82	58.2	71.3	60.7	63.4	85	40	73.2	54.9	52.3	49.5	53.8	51.7	81	51	78	70
J..	29.365	29.63	28.98	69.1	80.6	70.2	73.3	93	52	82.9	63.9	60.6	60.6	62.7	61.3	75	52	78	68
J..	29.325	29.53	29.09	72.5	86.4	74.1	77.7	97	54	87.8	67.6	65.5	64.7	68.6	66.3	.79	50	58	70
A..	29.316	29.56	28.96	69.5	83.0	71.9	74.8	94	51	84.7	66.3	64.3	63.8	65.6	64.6	84	54	81	73
S..	29.402	29.68	28.94	60.4	76.9	64.8	67.4	91	46	77.8	58.6	55.5	55.3	58.6	56.5	85	49	81	72
O..	29.317	29.66	28.58	47.0	63.5	50.2	53.6	74	34	65.6	44.1	43.9	49.8	46.9	46.9	90	62	89	80
N..	29.299	29.70	28.95	39.7	58.5	43.2	45.5	72	28	54.8	36.9	35.8	40.7	38.3	38.3	87	62	89	78
D..	29.379	30.03	28.71	34.1	47.0	37.8	39.6	65	16	49.4	31.3	26.6	28.8	29.5	28.3	75	51	72	66
Y..	29.342	30.09	28.58	49.1	62.6	52.4	54.7	97	4	64.7	45.8	43.0	44.3	45.4	44.2	80	54	78	71

MACKINAW CITY, MICH.

[Latitude, 45° 47′ N.; longitude, 84° 39′ W. Local time, 0.38 slow, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a.m.	Temperature. 3 p.m.	Temperature. 11 p.m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew point. 7 a.m.	Dew point. 3 p.m.	Dew point. 11 p.m.	Dew point. Mean.	Relative humidity. 7 a.m.	Relative humidity. 3 p.m.	Relative humidity. 11 p.m.	Relative humidity. Mean.
J..	29.317	29.87	28.50	9.3	15.6	12.4	12.4	40	-24	19.5	4.0	3.9	9.4	6.1	6.5	78	76	75	76
F..	29.273	29.83	28.68	3.0	13.3	6.9	7.7	43	-33	16.7	-3.0	-2.4	7.0	0.2	1.6	78	76	74	76
M..	29.346	29.78	28.55	5.6	18.8	11.5	12.0	41	-21	22.4	-2.1	1.4	10.5	6.0	6.0	83	76	78	77
A..	29.374	29.74	28.81	31.5	39.4	33.8	34.9	79	7	43.6	26.0	25.6	29.8	27.9	27.8	79	69	79	76
M..	29.244	29.56	28.77	42.3	49.2	41.8	44.4	81	27	53.4	36.4	35.6	37.0	35.5	36.0	79	64	79	74
J..	29.318	29.62	28.95	54.1	62.5	53.5	56.7	82	37	67.5	47.5	47.1	49.1	46.3	47.5	78	62	77	73
J..	29.282	29.61	29.02	62.6	70.8	62.6	65.3	86	44	74.6	55.6	56.5	58.6	56.7	57.3	81	67	81	76
A..	29.306	29.64	28.82	56.8	63.6	57.4	59.3	76	43	66.5	52.9	52.6	53.8	51.8	52.7	86	72	82	80
S..	29.338	29.58	28.91	52.2	59.6	54.9	55.6	80	38	63.8	49.1	47.9	48.8	48.2	48.3	86	69	79	78
O..	29.296	29.61	28.75	41.2	47.4	43.1	43.9	63	21	49.9	38.1	35.7	37.7	36.6	36.7	79	70	78	76
N..	29.289	29.68	28.79	35.8	38.8	36.8	37.1	59	27	40.7	32.9	30.2	31.7	30.3	30.7	80	76	78	78
D..	29.268	29.97	28.56	26.4	28.2	26.6	27.1	46	1	31.5	21.0	20.3	21.5	20.1	20.6	77	75	76	76
Y..	29.300	29.97	28.50	35.1	42.8	36.8	38.1	86	-33	45.8	29.9	29.5	32.9	30.5	31.0	80	71	78	76

MACON, FORT, N. C.

[Latitude, 34° 42′ N.; longitude, 76° 40′ W. Local time, 0.06 slow, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a.m.	Temperature. 3 p.m.	Temperature. 11 p.m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew point. 7 a.m.	Dew point. 3 p.m.	Dew point. 11 p.m.	Dew point. Mean.	Relative humidity. 7 a.m.	Relative humidity. 3 p.m.	Relative humidity. 11 p.m.	Relative humidity. Mean.
J..	30.176	30.70	29.74	43.7	49.2	45.0	46.0	63	22	52.3	38.1	38.8	40.1	40.8	39.9	83	72	85	80
F..	29.996	30.40	29.38	38.9	44.4	41.1	41.5	60	18	48.1	34.0	34.0	36.7	36.2	35.6	81	75	88	81
M..	30.075	30.56	29.66	41.6	49.1	45.1	45.3	64	24	52.3	37.8	37.0	40.8	40.6	39.5	84	74	86	81
A..	30.001	30.54	29.63	55.8	63.4	57.6	58.9	77	35	65.4	51.8	51.2	55.7	53.5	53.5	85	77	87	83
M..	29.944	30.15	29.55	65.5	71.5	66.4	67.8	79	51	73.2	62.9	62.4	65.3	63.5	63.7	90	82	91	87
J..	30.056	30.26	29.74	72.9	77.6	72.7	74.4	86	63	79.1	69.6	69.4	70.5	69.7	69.9	89	79	91	86
J..	30.019	30.24	29.75	78.0	83.0	78.5	79.8	87	64	84.2	75.4	75.0	77.6	75.8	76.1	91	84	92	89
A..	29.991	30.29	29.46	76.9	82.0	77.5	78.8	88	64	83.9	74.2	74.7	76.7	74.9	75.4	94	85	93	90
S..	30.056	30.30	29.54	71.0	75.9	71.0	72.6	84	57	77.9	68.0	68.3	70.9	68.4	69.2	91	85	91	89
O..	29.995	30.28	29.38	60.6	67.8	62.1	63.5	79	45	69.2	57.9	57.4	61.9	57.9	59.1	89	82	86	86
N..	30.008	30.38	29.57	50.9	59.7	52.9	54.5	72	34	61.2	47.6	47.6	54.3	49.1	50.3	89	83	87	86
D..	30.096	30.67	29.45	44.0	50.8	46.1	47.0	65	26	53.5	39.3	40.6	46.0	41.7	42.8	88	84	86	86
Y..	30.039	30.70	29.38	58.3	64.5	59.7	60.8	88	18	66.7	54.7	54.7	58.0	56.0	56.2	88	80	88	85

MAGINNIS, FORT, MONT.

[Latitude, 47° 12′ N.; longitude, 109° 10′ W. Local time, 2.16 slow, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a.m.	Temperature. 3 p.m.	Temperature. 11 p.m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew point. 7 a.m.	Dew point. 3 p.m.	Dew point. 11 p.m.	Dew point. Mean.	Relative humidity. 7 a.m.	Relative humidity. 3 p.m.	Relative humidity. 11 p.m.	Relative humidity. Mean.
J..	25.442	25.84	25.03	12.7	22.2	18.6	17.8	48	-15	27.3	8.5	0.2	5.7	4.7	3.5	57	56	55	56
F..	25.447	25.75	24.90	17.8	27.2	21.2	22.1	51	-17	30.8	13.0	4.2	8.1	6.8	6.4	55	43	54	51
M..	25.607	25.81	25.53	29.6	43.9	35.1	36.2	62	14	47.5	26.6	12.8	18.5	15.4	15.6	49	37	45	43
A..	25.520	25.80	25.14	36.9	49.0	38.7	41.5	72	19	53.1	30.5	24.6	32.1	24.9	27.2	61	55	56	56
M..	25.523	25.81	25.28	43.1	59.8	46.6	49.8	81	14	64.2	38.1	28.8	42.5	31.9	34.4	56	54	60	57
J..	25.565	25.87	25.07	49.9	65.3	53.5	56.2	89	33	70.1	46.2	38.8	50.3	41.5	43.5	67	61	66	64
J..	25.601	25.80	25.30	55.9	71.5	60.2	62.5	92	40	76.0	51.6	44.6	57.4	49.1	50.4	66	62	68	65
A..	25.641	25.87	25.35	54.6	69.8	58.2	60.9	96	41	73.9	49.6	43.0	53.0	45.7	47.2	66	57	64	62
J..	25.537	25.78	25.20	46.8	64.4	50.8	54.0	89	29	68.6	41.6	37.1	50.3	41.2	42.9	69	63	70	67
O..	25.576	25.89	25.22	38.1	57.1	42.6	45.9	83	22	60.4	33.6	26.1	36.8	29.0	30.6	62	49	56	57
N..	25.427	25.73	25.10	34.7	49.1	39.4	41.1	61	20	51.2	30.3	23.8	29.9	26.0	26.0	64	48	58	57
D..	25.464	25.84	25.04	29.5	39.5	32.2	33.7	65	- 4	41.7	25.1	18.8	22.9	19.7	20.5	64	52	60	58
Y..	25.529	25.89	24.90	37.5	51.6	41.4	43.5	96	-17	55.4	32.9	25.2	34.0	28.0	29.1	62	52	60	58

Monthly and yearly meteorological summaries—Continued.

LYNCHBURG, VA.

[H = [illegible]. h = 60.]

MACKINAW CITY, MICH.

[H = [illegible]. h = 34.]

MACON, FORT, N. C.

[H = 11. h = 5.]

MAGINNIS, FORT, MONT.

[H = 4,[illegible]. h = [illegible].]

Monthly and yearly meteorological summaries—Continued.

MARQUETTE, MICH.

[Latitude, 46° 34′ N.; longitude, 87° 24′ W. Local time, 0.49 slow, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a. m.	Temperature. 3 p. m.	Temperature. 11 p. m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew point. 7 a. m.	Dew point. 3 p. m.	Dew point. 11 p. m.	Dew point. Mean.	Relative humidity. 7 a. m.	Relative humidity. 3 p. m.	Relative humidity. 11 p. m.	Relative humidity. Mean.
	In.	In.	In.	°	°	°	°	°	°	°	°	°	°	°	°				
J..	29.257	29.80	28.59	4.1	12.4	6.4	7.6	...	....	.....	1.8	-0.6	1.9	1.4	0.9	...	...	...	...
F..	......	.....	.....	....	....	....	....	...	....	.....	....	.....	....	....	....	...	...	...	...
M.	29.291	29.72	28.54	8.0	17.2	10.7	12.0	49	-15	22.0	2.2	4.2	11.5	6.1	7.3	84	78	82	81
A..	29.288	29.66	28.71	31.6	39.6	33.5	34.9	76	10	44.1	26.7	25.8	27.1	26.6	26.5	79	63	77	73
M.	29.165	29.52	28.54	43.7	48.6	43.8	45.4	81	27	54.1	37.3	35.3	36.6	35.7	35.5	75	64	76	72
J..	29.231	29.57	28.81	54.1	59.7	53.5	55.8	83	33	67.1	45.3	46.0	46.0	45.0	45.7	75	65	78	72
J..	29.179	29.50	28.80	61.4	68.2	61.6	63.7	89	46	74.4	54.1	54.3	54.8	55.1	54.7	78	64	80	74
A..	29.224	29.61	28.77	56.0	61.9	56.1	58.0	83	33	65.7	50.7	49.9	51.2	50.5	50.5	81	70	82	78
S..	29.228	29.52	28.78	51.0	61.8	53.8	55.5	87	34	67.0	46.1	43.8	45.0	44.8	44.4	77	58	72	69
O..	29.238	29.54	28.85	39.2	45.4	40.3	41.6	76	27	49.5	36.0	33.7	34.5	34.2	34.1	81	69	79	77
N..	29.202	29.60	28.73	33.4	35.7	33.7	34.3	50	23	39.3	30.7	29.7	29.8	29.1	29.5	87	79	83	83
D..	29.218	29.88	28.67	21.9	25.5	22.7	23.4	48	-8	32.4	17.2	18.6	20.1	19.2	19.3	87	80	86	84
Y..	....	......	......	.....	.....	.....	.....	...	....	.....	....	......	.....	.....	.....	...	...	...	...

MEMPHIS, TENN.

[Latitude, 35° 9′ N.; longitude, 90° 3′ W. Local time, 1.00 slow, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a. m.	Temperature. 3 p. m.	Temperature. 11 p. m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew point. 7 a. m.	Dew point. 3 p. m.	Dew point. 11 p. m.	Dew point. Mean.	Relative humidity. 7 a. m.	Relative humidity. 3 p. m.	Relative humidity. 11 p. m.	Relative humidity. Mean.
J..	29.857	30.33	29.14	31.8	40.5	37.3	36.5	66	3	44.4	26.1	25.8	30.1	28.8	28.2	79	68	72	73
F..	29.722	30.09	29.18	33.7	43.3	40.0	39.0	68	10	47.4	30.7	27.2	29.0	28.8	28.3	77	58	65	67
M.	29.798	30.21	29.50	42.4	53.1	48.3	47.9	74	26	56.8	39.9	33.6	32.6	35.5	33.9	73	49	64	62
A..	29.683	30.05	29.32	56.9	70.3	63.2	63.5	84	35	73.1	55.1	47.9	48.0	49.3	48.4	73	48	62	61
M.	29.617	29.93	29.17	62.6	74.9	67.7	68.4	90	41	77.6	57.0	55.4	52.3	56.5	54.7	78	48	69	65
J..	29.698	29.86	29.45	73.7	86.2	77.9	79.3	96	64	89.0	70.7	67.1	66.2	69.1	67.5	81	58	75	69
J..	29.688	29.86	29.54	77.1	88.0	80.2	81.8	96	64	90.8	74.8	71.9	69.6	72.8	71.4	84	56	79	73
A..	29.663	29.83	29.38	73.7	87.3	77.5	79.5	98	59	88.5	71.5	68.0	67.8	68.8	68.2	83	53	75	70
S..	29.681	29.86	29.46	67.1	79.4	71.7	72.7	88	52	81.6	66.1	62.8	64.2	65.1	64.0	87	62	81	76
O..	29.669	30.00	29.36	52.4	67.0	58.1	59.2	81	42	68.3	51.3	48.8	46.9	49.5	48.4	88	50	74	71
N..	29.666	29.93	29.25	45.8	59.8	50.5	52.0	80	30	61.5	43.8	39.0	35.8	38.1	37.6	78	45	65	63
D..	29.790	30.22	29.04	36.9	48.6	42.4	42.6	68	18	51.8	34.7	29.1	30.9	31.2	30.4	74	54	66	65
Y..	29.711	30.33	29.04	54.5	66.5	59.6	60.2	98	3	69.2	51.8	48.0	47.8	49.5	48.4	80	54	71	68

MILWAUKEE, WIS.

[Latitude, 43° 2′ N.; longitude, 87° 54′ W. Local time, 0.51 slow, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a. m.	Temperature. 3 p. m.	Temperature. 11 p. m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew point. 7 a. m.	Dew point. 3 p. m.	Dew point. 11 p. m.	Dew point. Mean.	Relative humidity. 7 a. m.	Relative humidity. 3 p. m.	Relative humidity. 11 p. m.	Relative humidity. Mean.
J..	29.306	29.90	28.37	6.5	14.4	10.3	10.4	44	-21	18.5	2.0	2.5	7.0	5.3	4.9	83	73	80	79
F..	29.206	29.76	28.62	4.9	15.1	10.3	10.1	41	-24	19.2	1.4	1.8	8.5	6.8	5.7	87	76	86	83
M.	29.275	29.67	28.61	20.3	28.6	24.5	24.5	54	-4	32.1	17.2	16.6	19.3	18.4	18.1	85	69	78	77
A..	29.263	29.58	28.76	37.0	44.4	39.7	40.4	77	22	48.3	33.8	32.4	33.4	34.0	33.3	83	68	81	77
M.	29.164	29.42	28.72	46.4	53.7	49.1	49.7	80	27	59.9	42.4	39.1	38.6	40.5	39.4	76	60	74	70
J..	29.261	29.57	28.90	56.5	65.6	58.6	60.2	86	40	70.8	50.5	50.9	52.7	51.9	51.8	82	65	79	75
J..	29.208	29.51	28.97	64.4	74.0	66.9	68.4	93	52	78.6	60.0	60.0	61.7	61.1	60.9	86	67	82	78
A..	29.227	29.58	28.85	59.6	67.8	61.9	63.1	85	46	70.9	56.7	55.7	55.9	57.1	56.2	87	68	85	80
S..	29.256	29.49	28.68	55.2	65.9	59.0	60.0	84	41	69.2	53.0	49.9	50.9	52.7	51.2	83	61	80	75
O..	29.196	29.50	28.83	42.9	51.5	44.8	46.4	69	31	53.9	40.4	37.6	40.7	39.7	39.3	82	69	83	78
N..	29.183	29.62	28.73	35.2	40.3	37.1	37.5	60	22	43.0	32.5	30.9	32.6	32.5	32.0	84	74	83	81
D..	29.238	29.84	28.39	24.6	28.8	25.6	26.8	47	-11	32.4	20.1	21.4	23.8	22.1	22.4	87	82	86	85
Y..	29.232	29.90	28.37	37.8	45.8	40.6	41.4	93	-24	49.7	34.2	33.2	35.4	35.2	34.6	84	69	81	78

MOBILE, ALA.

[Latitude, 30° 41′ N.; longitude, 88° 2′ W. Local time, 0.52 slow, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a. m.	Temperature. 3 p. m.	Temperature. 11 p. m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew point. 7 a. m.	Dew point. 3 p. m.	Dew point. 11 p. m.	Dew point. Mean.	Relative humidity. 7 a. m.	Relative humidity. 3 p. m.	Relative humidity. 11 p. m.	Relative humidity. Mean.
J...	30.159	30.51	29.78	42.7	54.5	47.3	48.2	70	20	56.7	39.3	39.1	39.9	41.7	40.2	86	62	82	77
F..	30.041	30.41	29.51	42.8	55.5	46.7	48.3	77	28	58.8	40.2	38.2	38.8	37.0	38.0	85	59	71	71
M..	30.121	30.51	29.74	46.5	60.7	53.2	53.5	78	29	63.2	44.3	42.3	41.7	44.9	43.0	86	55	74	72
A..	30.033	30.31	29.80	61.4	71.9	65.3	66.2	86	40	74.1	59.1	56.7	57.7	58.7	57.7	85	63	80	76
M..	29.934	30.09	29.64	66.5	77.8	70.9	71.7	86	53	80.1	64.1	62.3	59.6	62.6	61.5	86	56	76	73
J...	30.023	30.15	29.79	74.0	85.4	77.0	78.8	93	63	88.2	71.0	70.2	69.5	71.0	70.2	88	61	83	77
J...	30.018	30.21	29.81	75.2	86.1	77.8	79.7	94	66	89.5	72.8	71.7	70.8	72.1	71.5	89	62	83	78
A..	29.965	30.16	29.79	75.4	83.9	77.7	79.0	94	69	88.4	72.9	73.5	73.1	74.2	73.6	94	72	90	85
S..	29.940	30.12	29.69	72.5	82.1	75.1	76.6	90	60	84.9	70.8	70.3	71.4	72.0	71.2	93	71	91	85
O..	29.991	30.28	29.68	55.8	71.1	61.8	62.9	82	41	72.9	58.7	52.1	52.9	55.7	53.6	88	55	80	74
N..	30.052	30.30	29.74	50.6	62.9	55.2	56.2	75	32	65.2	47.2	46.4	44.5	48.6	46.5	86	56	80	74
D..	30.175	30.53	29.67	43.8	57.1	48.5	49.5	69	26	59.0	40.0	37.4	39.4	41.4	39.4	82	56	77	72
Y..	30.038	30.53	29.51	58.8	70.8	63.0	64.2	94	20	73.4	56.3	55.0	54.9	56.7	55.5	88	61	80	76

Monthly and yearly meteorological summaries—Continued.

MARQUETTE, MICH.

[H=672. h=57.]

MEMPHIS, TENN.

[H=320. h=51.]

MILWAUKEE, WIS.

[H=697. h=125.]

MOBILE, ALA.

[H=35. h=81.]

4.7	6.3	4.5	5.2	5,910	28	SE.	29	11	9	11	10	5	4	6	6	11.95	3.07	11	9	11	17	0	6	0	0	0	J.
5.7	5.1	3.5	4.8	5,576	32	SW.	29	10	3	4	16	9	4	6	4	2.85	1.43	11	10	7	9	0	6	0	1	0	F.
6.0	4.6	4.0	4.9	4,193	26	W.	23	3	2	9	14	5	8	19	10	6.36	1.92	10	12	9	9	0	2	0	1	0	M.
6.3	5.2	3.8	4.9	5,230	21	SE.	12	6	4	22	17	8	4	8	11	5.24	3.43	5	21	4	6	0	0	0	1	0	A.
4.3	5.6	4.1	5.3	4,002	32	NE.	11	4	3	11	24	6	3	11	16	3.27	1.86	5	22	4	11	0	0	0	1	0	M.
4.9	5.6	2.2	4.2	3,003	32	SE.	8	3	2	17	11	5	5	7	32	4.10	1.07	6	23	1	12	0	0	8	10	0	J.
5.1	5.3	3.7	4.7	2,944	24	N.	15	5	2	0	12	12	10	16	12	3.81	0.86	6	23	2	15	0	0	14	10	0	J.
5.5	5.4	2.2	4.4	4,562	44	SE.	18	13	4	11	12	9	15	11	0	6.07	1.49	10	17	4	20	0	0	9	12	0	A.
7.6	6.2	3.2	5.7	4,624	25	NE.	18	16	5	11	12	6	4	15	3	9.25	3.23	4	18	8	16	0	0	1	0	0	S.
5.7	3.7	1.9	3.8	5,503	28	W.	29	9	3	5	6	6	12	22	1	1.19	0.66	14	12	5	6	0	0	0	0	0	O.
6.6	3.8	2.0	4.1	5,602	28	E.	16	1	3	11	18	3	6	31	1	4.83	1.53	13	11	6	6	0	0	0	1	0	N.
4.9	3.1	2.4	2.5	6,090	36	S.	19	2	6	11	10	8	6	30	1	5.00	4.18	13	14	4	4	0	6	0	1	0	D
5.8	5.0	2.1	4.6	60,258		....	227	81	46	132	166	82	81	191	30	64.00	4.18	106	152	65	128	0	21	32	41	0	Y.

Monthly and yearly meteorological summaries—Continued.

MONTGOMERY, ALA.

[Latitude, 32° 23′ N.; longitude, 86° 18′ W. Local time, 0.45 slow, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a.m.	Temperature. 3 p.m.	Temperature. 11 p.m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean maximum.	Temperature. Mean minimum.	Dew point. 7 a.m.	Dew point. 3 p.m.	Dew point. 11 p.m.	Dew point. Mean.	Relative humidity. 7 a.m.	Relative humidity. 3 p.m.	Relative humidity. 11 p.m.	Relative humidity. Mean.
	In.	*In.*	*In.*	°	°	°	°	°	°	°	°	°	°	°	°				
J...	[illegible]	30.23	29.60	40.0	51.9	45.6	46.2	72	19	56.2	36.9	34.8	38.1	38.7	37.7	85	68	77	73
F...	[illegible]	30.22	29.21	38.7	52.6	45.0	45.4	79	16	55.6	35.4	33.1	32.7	35.3	34.0	81	65	70	67
M...	29.912	30.31	29.57	44.0	59.7	51.4	51.7	76	26	62.2	44.5	39.8	37.8	41.4	39.5	84	46	76	67
A...	29.842	30.18	29.57	58.3	74.6	64.4	65.8	86	34	76.8	56.6	52.6	48.6	52.8	51.7	82	44	67	64
M...	29.789	29.94	29.39	64.3	77.7	68.2	70.1	89	48	80.4	61.2	58.4	56.1	60.6	58.7	82	54	75	71
J...	29.822	29.95	29.41	74.7	87.6	77.6	79.8	95	63	90.6	70.2	69.2	67.3	70.0	68.8	85	53	78	72
J...	29.819	30.01	29.58	75.0	88.0	77.7	80.2	98	63	91.0	71.7	71.1	70.8	72.5	71.5	88	59	85	77
A...	29.776	29.99	29.58	74.5	86.8	77.9	79.7	95	65	89.3	71.7	72.3	72.3	72.6	72.4	93	63	84	80
S...	29.774	29.96	29.54	70.1	81.7	73.7	75.2	91	55	83.2	68.2	67.7	69.8	69.7	69.1	93	69	86	83
O...	29.789	30.05	29.40	53.9	69.4	59.5	60.9	79	40	70.7	51.9	50.8	50.7	53.9	51.8	88	54	79	74
N...	29.842	30.10	29.40	48.1	61.9	52.9	54.3	78	31	63.8	45.4	44.2	41.1	45.6	43.6	87	51	77	72
D...	29.964	30.27	29.46	39.3	54.9	45.8	46.6	70	25	57.2	36.6	33.3	34.6	36.4	34.6	79	48	71	66
Y...	29.841	30.37	29.21	58.8	70.6	61.6	63.0	98	16	72.0	53.8	53.3	51.9	54.6	53.7	86	56	77	72

MONTROSE, COLO.

[Latitude, 38° 30′ N.; Longitude, 107° 50′ W. Local time, 2.13 slow, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a.m.	Temperature. 3 p.m.	Temperature. 11 p.m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean maximum.	Temperature. Mean minimum.	Dew point. 7 a.m.	Dew point. 3 p.m.	Dew point. 11 p.m.	Dew point. Mean.	Relative humidity. 7 a.m.	Relative humidity. 3 p.m.	Relative humidity. 11 p.m.	Relative humidity. Mean.
J...	......	......	......	....	....	....	....	..	....	....	....	......	......	......	......	...	...	..	..
F...	24.178	24.64	23.94	22.0	36.4	30.2	29.6	57	6	42.1	20.6	19.6	27.0	24.8	22.7	68	70	79	72
M...	24.251	24.62	24.09	22.0	50.9	38.1	39.3	68	16	53.5	27.6	23.6	25.7	27.4	28.2	67	41	67	66
A...	24.223	24.47	23.90	34.4	54.2	44.6	45.7	73	27	59.0	37.2	33.6	32.2	35.4	34.1	64	51	72	62
M...	24.237	24.41	24.09	43.2	64.7	53.1	53.7	84	34	69.4	42.4	34.3	32.3	35.4	32.7	72	28	54	51
J...	24.304	24.46	23.90	50.2	74.0	62.1	62.1	86	28	76.9	49.7	36.6	29.0	36.0	32.8	61	23	46	41
J...	24.397	24.50	24.27	57.2	81.6	68.9	69.2	96	50	86.6	56.2	46.9	45.2	48.6	46.7	68	31	56	50
A...	24.395	24.49	24.28	54.4	78.0	63.9	65.8	97	45	82.7	52.8	46.1	43.6	49.3	47.1	74	36	62	57
S...	24.348	24.45	24.04	47.2	74.0	58.2	59.8	88	31	77.5	45.7	39.1	37.6	39.1	38.6	74	30	61	55
O...	24.373	24.83	24.16	36.3	63.2	44.6	48.0	79	19	66.5	33.6	27.6	31.7	30.8	29.7	71	33	56	54
N...	24.316	24.61	23.73	27.3	48.8	35.8	37.3	69	13	52.7	25.3	21.1	34.7	26.5	24.1	77	42	70	63
D...	24.300	24.74	23.77	18.7	36.6	28.8	27.5	65	−10	40.8	17.6	14.1	24.6	21.7	20.1	81	64	[illegible]	73
Y...	......	......	......	....	....	....	....	..	....	....	....	......	......	......	......	...	...	..	..

MOORHEAD, MINN.

[Latitude, 46° 53′ N.; Longitude, 96° 44′ W. Local time, 1.37 slow, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a.m.	Temperature. 3 p.m.	Temperature. 11 p.m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean maximum.	Temperature. Mean minimum.	Dew point. 7 a.m.	Dew point. 3 p.m.	Dew point. 11 p.m.	Dew point. Mean.	Relative humidity. 7 a.m.	Relative humidity. 3 p.m.	Relative humidity. 11 p.m.	Relative humidity. Mean.
J...	29.075	29.66	28.41	−6.4	4.8	−1.7	−0.8	42	−35	9.9	−11.6	−12.8	−3.6	−8.6	−8.6	76	68	72	72
F...	29.016	29.45	28.44	−4.2	8.4	3.4	2.9	50	−30	14.6	− 7.1	−12.1	0.8	−5.5	−5.7	73	[illegible]	[illegible]	71
M...	29.081	29.60	28.35	17.5	28.7	21.4	22.5	40	−15	32.0	12.2	11.3	17.2	12.4	14.0	76	61	71	69
A...	28.942	29.34	28.30	33.8	48.2	40.2	40.7	67	14	52.2	32.1	30.4	34.0	34.2	33.3	87	62	79	76
M...	28.903	29.24	28.46	45.0	62.0	50.7	52.0	85	21	65.2	41.8	40.5	44.3	43.7	42.8	84	55	77	72
J...	28.954	29.30	28.34	55.9	70.4	60.6	62.3	86	30	74.5	51.4	53.0	56.3	56.3	55.0	90	66	88	81
J...	28.986	29.20	28.39	61.5	76.6	66.0	68.8	92	43	79.9	57.9	58.9	63.4	62.1	61.5	97	64	87	81
A...	28.980	29.34	28.54	50.5	71.1	58.1	60.2	91	22	73.8	48.1	48.7	52.2	52.6	51.2	93	53	88	78
S...	28.918	29.30	28.33	45.4	69.3	54.4	56.4	92	26	71.8	42.5	42.0	43.8	43.6	44.5	89	46	74	69
O...	28.978	29.28	28.57	31.4	50.8	39.5	40.6	64	16	54.5	28.6	28.7	33.6	32.3	31.5	90	65	76	76
N...	28.974	29.15	28.82	25.1	31.8	26.6	27.8	46	5	34.4	21.9	22.1	28.4	24.6	24.7	92	81	92	88
D...	28.969	29.47	28.32	12.3	19.6	13.9	15.3	43	−20	25.3	4.1	10.8	15.7	12.1	12.9	90	83	92	90
Y...	[illegible]	29.66	28.30	30.7	45.2	36.2	37.4	92	−35	49.1	27.6	28.9	32.6	30.2	30.8	88	64	88	77

MOUNT WASHINGTON, N. H.

[Latitude, 44° 16′ N.; longitude, 71° 18′ W. Local time, 0.15 fast, Eastern.]

Monthly and yearly meteorological summaries—Continued.

MONTGOMERY, ALA.

[$H=219$. $h=58$.]

Cloudiness (in tenths). 7 a. m.	3 p. m.	11 p. m.	Mean.	Wind. Total (miles).	Maximum.	Direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Precipitation. Total.	Max. 24 hours.	Number of days— Clear.	Fair.	Cloudy.	Rain or snow.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder-storms.	Auroras.	Months and year.
																In.	*In.*										
7.0	6.5	6.2	6.6	5,341	29	W.	21	13	14	7	4	9	7	16	2	9.72	3.13	6	7	18	17	0	10	0	1	0	J.
5.3	6.2	2.7	4.7	4,617	27	W.	18	6	6	5	9	10	13	13	4	3.68	1.39	10	9	9	11	0	9	0	3	0	F.
4.5	4.6	3.2	4.1	4,117	23	E., NW.	15	3	5	10	5	15	4	24	12	2.93	0.58	13	9	7	12	0	2	0	3	0	M.
5.1	3.4	3.7	4.0	4,203	20	NW.SE.NE	13	11	3	18	7	11	4	18	5	3.92	1.74	9	17	4	8	0	0	0	2	0	A.
6.1	5.9	3.5	5.1	3,543	23	NW.	4	7	0	12	11	14	2	30	4	8.92	2.30	10	9	12	13	0	0	0	5	0	M.
4.2	5.1	2.8	4.0	2,914	23	NW.	15	11	5	12	8	13	6	8	12	4.32	2.51	6	21	1	9	0	0	21	2	0	J.
6.1	5.9	4.7	5.6	2,862	28	N.	8	18	7	6	14	13	4	14	9	7.54	1.64	4	21	6	21	0	0	21	10	0	J.
5.7	6.3	2.9	5.3	2,663	24	NE.	5	24	2	7	6	11	1	28	9	3.93	1.06	7	17	7	13	0	0	14	6	0	A.
5.6	6.6	5.1	5.8	3,612	22	E.	5	35	13	10	6	6	1	8	4	4.83	1.49	7	12	11	15	0	0	1	4	0	S.
5.0	4.8	2.9	4.2	3,870	24	NW.	7	12	8	9	3	6	5	30	13	2.38	1.04	14	10	7	6	0	0	0	0	0	O.
5.3	4.4	3.7	4.5	3,605	23	NW.	2	2	3	13	9	6	5	36	14	3.50	1.92	12	10	8	10	0	1	0	3	0	N.
4.6	5.2	3.4	4.4	4,132	32	S.	11	1	5	11	4	13	10	20	16	3.13	2.08	12	11	8	5	0	9	0	1	0	D.
5.4	5.3	3.9	4.9	45,575	..	....	124	146	80	120	85	126	62	245	106	58.89	3.13	114	153	98	140	0	31	57	40	0	Y.

MONTROSE, COLO.

[$H=5828$. $h=22$.]

7 a. m.	3 p. m.	11 p. m.	Mean.	Total (miles).	Maximum.	Direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Total.	Max. 24 hours.	Clear.	Fair.	Cloudy.	Rain or snow.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder-storms.	Auroras.	Months and year.
...	...	...	...	......	..	....	..	..	..	..	..	..	..	..	..	.....	.....	..	..	..	..	..	..	..	..	..	J.
5.8	6.5	5.4	5.9	3,058	28	NW.	9	4	16	12	2	5	4	16	1	0.22	0.10	4	12	7	6	3	22	0	0	0	F.
2.1	4.5	3.2	3.6	4,996	38	NW.	4	6	39	10	2	4	14	14	0	0.67	0.10	17	7	7	8	0	24	0	1	0	M.
5.7	7.0	5.2	6.0	5,401	40	W.	1	5	26	20	1	12	12	13	0	1.86	0.24	3	19	8	20	0	3	0	4	0	A.
2.7	5.7	3.4	3.9	6,243	36	SW.	4	0	9	24	4	19	20	13	0	0.86	0.29	12	15	4	7	0	0	0	7	0	M.
1.9	6.4	2.7	4.0	7,093	50	SW.	0	0	6	34	9	26	11	4	0	1.02	0.59	13	14	3	4	0	0	0	4	0	J.
3.2	5.3	3.6	4.0	5,634	44	SW.	4	2	14	32	6	13	17	5	0	1.03	0.38	13	11	7	10	0	0	7	14	0	J.
2.9	5.1	3.2	3.7	5,518	36	SW.	1	1	5	42	10	9	15	9	1	2.23	0.92	15	11	5	11	0	0	7	12	0	A.
2.2	3.4	2.3	2.6	5,907	36	SE., SW.	5	2	5	43	6	10	13	6	0	0.53	0.15	16	10	2	6	0	1	0	0	0	S.
2.3	3.5	1.9	2.6	4,616	25	SW.	4	2	10	44	2	1	2	27	1	0.56	0.37	20	8	3	5	0	17	0	2	0	O.
4.6	5.0	4.7	4.8	4,020	38	SW.	1	2	4	45	1	6	10	15	6	0.50	0.26	10	10	10	7	0	27	0	0	0	N.
4.9	5.4	5.3	5.2	3,648	34	SW.	9	1	9	35	6	3	7	18	3	0.71	0.27	11	8	12	11	5	31	0	1	0	D.
...	...	...	...	......	..	....	..	..	..	..	..	..	..	..	..	.....	.....	..	..	..	..	..	..	..	..	..	Y.

MOORHEAD, MINN.

[$H=922$. $h=41$.]

7 a. m.	3 p. m.	11 p. m.	Mean.	Total (miles).	Maximum.	Direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Total.	Max. 24 hours.	Clear.	Fair.	Cloudy.	Rain or snow.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder-storms.	Auroras.	Months and year.
2.4	5.4	2.2	3.3	6,152	36	S.	13	2	0	2	18	15	10	23	10	0.02	0.02	13	17	1	2	26	31	0	0	1	J.
2.8	5.7	3.4	4.0	5,975	29	N.	20	4	0	0	16	13	7	22	2	0.08	0.06	12	9	7	2	21	28	0	0	1	F.
6.8	6.0	3.9	5.6	8,764	44	N.	42	7	2	5	7	6	15	6	0	0.31	0.24	7	16	7	4	14	31	0	0	1	M.
5.6	6.4	4.0	5.3	9,273	40	NW.	27	7	4	16	20	6	2	6	0	3.43	1.63	7	15	8	9	0	12	0	1	2	A.
6.0	6.7	4.2	5.6	8,440	40	N.	24	13	1	11	19	6	6	11	2	2.27	1.18	7	16	8	6	0	6	0	2	1	M.
5.0	7.1	4.3	5.8	6,695	42	SE.	18	10	1	16	18	11	7	7	2	7.05	2.60	7	13	10	12	0	1	0	12	0	J.
5.9	5.9	4.1	5.4	6,466	51	N.	17	7	7	17	18	7	7	11	2	3.31	1.04	5	19	7	12	0	0	1	8	0	J.
3.4	6.2	3.9	4.5	6,601	40	SE.	22	7	5	11	21	7	5	14	1	1.47	0.53	10	18	3	8	0	0	1	7	0	A.
2.9	4.5	3.0	3.5	7,257	48	S.	13	4	4	11	17	24	13	10	4	2.20	1.40	14	14	2	4	0	5	1	1	2	S.
5.1	6.2	4.0	5.1	7,334	42	S.	26	3	2	9	21	4	13	14	1	0.68	0.23	11	10	10	7	0	23	0	0	2	O.
6.6	7.0	6.0	6.5	7,332	32	N.	20	6	5	18	20	5	4	9	3	0.64	0.38	5	14	11	8	9	30	0	0	1	N.
5.6	6.8	4.3	5.6	8,720	50	S.	20	4	1	9	28	9	8	13	1	0.32	0.10	6	15	10	6	21	31	0	0	1	D.
4.9	6.2	3.9	5.0	89,039	..	....	262	74	32	125	223	105	97	148	28	22.68	1.63	104	176	84	82	91	198	3	31	12	Y.

MOUNT WASHINGTON, N. H.

[$H=6,279$. $h=2$.]

Monthly and yearly meteorological summaries—Continued.

MYER, FORT, VA.

[Latitude, 38° 53′ N.; longitude 77° 0′ W. Local time, 0.08 slow, Eastern.]

Months and year.	Pressure.			Temperature.								Dew point.				Relative humidity.			
										Mean.									
	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.
	In.	In.	In.	°	°	°	°	°	°	°	°	°	°	°	°				
J..	29.868	30.56	29.23	28.5	35.2	30.7	31.5	67		42.8	22.9	22.9	25.1	24.5	24.2	81	69	79	76
F..	29.737	30.22	29.02	21.8	29.8	24.1	25.1	49	1	33.2	17.6	17.6	20.3	19.9	19.8	85	68	84	79
M.	29.795	30.20	29.37	28.6	38.9	31.9	33.1	72	8	42.4	24.7	21.9	25.5	23.0	23.5	77	62	70	70
A..	29.791	30.41	29.32	44.9	61.3	50.3	52.2	85	29	63.8	42.1	38.2	39.4	40.3	39.3	78	47	69	65
M.	29.700	29.93	29.26	57.0	67.6	59.0	61.2	85	40	70.6	52.7	51.6	52.2	51.7	51.8	83	62	79	75
J..	29.770	30.04	29.27	64.6	79.0	67.5	70.4	95	50	81.4	59.4	57.9	58.1	58.2	58.1	79	50	73	67
J..	29.713	29.92	29.46	73.2	85.7	75.8	78.2	98	63	88.3	69.2	67.1	66.5	67.3	67.1	82	55	76	71
A..	29.721	29.98	29.36	67.1	79.9	69.8	72.3	94	49	81.8	64.0	63.2	63.5	63.0	63.2	88	59	80	75
S..	29.819	30.11	29.29	58.5	73.7	63.4	65.2	90	43	75.2	56.0	54.5	57.2	57.1	56.3	87	58	80	75
O..	29.749	30.10	28.90	49.2	60.9	52.9	54.3	76	35	63.5	46.1	45.8	47.4	47.6	46.9	89	63	82	78
N..	29.711	30.11	29.35	40.3	49.8	43.2	44.4	72	29	51.2	37.3	35.6	37.2	36.8	36.5	84	65	78	76
D..	29.789	30.51	29.08	31.9	41.4	35.9	36.4	63	12	44.7	29.0	24.5	28.5	27.2	26.7	75	62	71	70
Y..	29.764	30.56	29.02	47.1	58.6	50.4	52.0	98	1	61.5	43.4	41.7	43.4	43.0	42.7	82	60	77	73

NASHVILLE, TENN.

[Latitude, 36° 10′ N.; longitude, 86° 47′ W. Local time, 0.47 slow, Eastern.]

J..	29.595	30.07	28.92	28.3	39.0	32.1	33.1	65	-2	43.3	24.1	23.2	28.6	25.8	25.9	81	67	78	75
F..	29.457	29.86	28.85	28.1	40.4	31.6	33.4	70	-1	43.2	23.0	23.6	28.9	24.8	25.8	83	65	76	75
M.	29.533	29.93	29.22	35.2	50.2	40.0	41.8	74	17	53.5	32.4	29.9	34.5	31.0	31.8	81	57	71	70
A..	29.452	29.79	29.05	51.9	66.4	58.3	58.9	82	34	69.8	49.9	44.0	47.8	47.7	46.5	75	53	69	66
M.	29.374	29.60	28.92	59.1	72.5	64.3	65.3	83	42	75.1	57.0	54.4	54.8	55.8	55.0	85	56	75	72
J..	29.470	29.65	29.24	70.6	82.4	73.2	75.4	92	60	84.3	68.2	64.7	66.6	66.2	65.8	82	59	79	73
J..	29.445	29.63	29.24	73.1	86.1	76.1	78.4	96	58	88.1	71.0	68.7	69.6	70.2	69.5	86	59	82	76
A..	29.410	29.57	29.15	71.5	85.8	74.7	77.8	96	56	87.4	69.6	66.1	66.7	65.7	66.2	83	54	74	70
S..	29.454	29.67	29.21	64.7	77.9	68.4	70.3	88	46	80.0	63.0	59.8	62.2	60.5	60.8	84	61	77	74
O..	29.421	29.69	29.01	49.1	64.6	53.3	55.7	78	33	66.4	47.0	46.1	49.7	47.8	47.9	89	60	82	77
N..	29.446	29.70	28.96	42.8	55.5	47.4	48.6	72	30	57.8	41.0	38.2	40.3	39.2	39.2	84	58	74	72
D..	29.562	30.03	28.87	35.7	46.3	39.0	40.3	64	18	49.0	32.1	30.2	32.4	30.8	31.1	80	59	73	71
Y..	29.468	30.07	28.85	50.8	63.9	54.9	56.5	96	-2	66.5	48.2	45.7	48.5	47.1	47.1	83	59	76	73

NEW HAVEN, CONN.

[Latitude, 41° 18′ N.; longitude, 72° 56′ W. Local time, 0.08 fast, Eastern.]

J..	29.963	30.70	29.14	24.3	30.2	25.9	26.8	54	-1	35.1	18.5	19.0	20.5	20.1	19.9	80	68	79	75
F..	29.852	30.34	28.97	15.9	24.4	18.9	19.7	51	-2	29.0	12.2	11.6	15.8	13.8	13.7	83	70	80	78
M..	29.911	30.38	29.39	22.5	32.5	25.7	26.9	53	zero	36.0	18.4	17.1	19.9	20.0	19.0	80	60	79	73
A..	29.901	30.45	29.23	41.9	53.2	43.0	46.0	83	23	56.1	36.5	33.6	32.9	34.4	33.6	73	49	74	66
M..	29.875	30.10	29.48	52.8	60.3	52.1	54.9	82	31	64.1	46.2	43.8	43.1	44.2	43.7	74	57	76	69
J..	29.873	30.17	29.35	62.0	72.8	61.4	65.2	89	45	75.8	55.0	54.4	52.8	52.5	53.2	77	53	73	68
J..	29.836	30.12	29.60	68.3	79.0	69.1	72.1	93	50	81.3	63.4	62.1	61.2	63.2	62.2	81	56	82	73
A..	29.869	30.17	29.55	64.1	74.1	65.1	67.8	86	45	76.8	60.4	59.5	60.1	60.5	60.0	85	63	86	78
S..	29.941	30.28	29.24	55.4	68.6	58.1	60.7	83	38	72.0	51.0	50.8	52.7	53.5	52.3	85	58	85	76
O..	29.910	30.20	29.18	47.0	58.5	49.3	51.6	76	31	60.9	43.0	43.2	46.2	43.9	44.4	87	66	82	78
N..	29.810	30.21	29.42	38.6	47.1	41.6	42.4	65	19	49.5	35.6	33.6	35.7	35.2	34.8	82	67	78	76
D..	29.869	30.60	29.03	30.7	37.0	32.2	33.3	56	10	41.5	25.2	24.2	23.6	23.6	23.8	76	59	70	69
Y..	29.886	30.70	28.97	43.6	53.1	45.2	47.3	93	-2	56.5	38.8	37.7	38.7	38.7	38.4	80	60	79	73

NEW LONDON, CONN.

[Latitude, 41° 21′ N.; longitude, 72° 5′ W. Local time, 0.12 fast, Eastern.]

J..	30.040	30.78	29.28	26.9	32.0	28.2	29.0	54	1	36.6	21.0	21.6	22.8	19.6	21.3	81	70	71	74
F..	29.920	30.39	29.00	18.9	27.5	21.8	22.7	44	2	30.5	14.9	12.1	16.7	14.1	14.3	75	64	72	70
M..	29.987	30.48	29.47	25.8	34.4	28.8	29.7	53	6	36.9	21.5	19.3	20.6	21.3	20.4	77	58	73	69
A..	29.975	30.52	29.25	44.6	51.8	44.8	47.0	78	26	55.7	38.1	34.5	35.6	35.4	35.2	69	58	72	66
M..	29.952	30.27	29.51	53.8	57.7	52.0	54.5	80	35	62.0	47.1	44.3	43.9	44.5	44.2	72	63	77	71
J..	29.949	30.26	29.45	64.5	70.6	61.2	65.4	83	46	73.0	56.6	55.8	55.4	53.8	55.0	73	61	77	71
J..	29.987	30.20	29.65	69.9	75.9	68.4	71.4	92	53	79.5	64.4	63.4	64.3	63.9	63.9	80	69	86	78
A..	29.950	30.23	29.65	66.2	72.9	66.1	68.4	85	49	75.4	61.9	62.0	65.4	62.0	63.1	87	78	87	84
S..	30.020	30.37	29.28	57.5	66.6	58.8	61.0	79	39	69.5	52.2	51.9	55.8	52.1	53.3	82	69	79	76
O..	30.000	30.30	29.24	49.5	58.6	50.7	52.9	75	35	61.5	45.3	45.0	48.5	45.6	46.4	85	70	82	79
N..	29.895	30.31	29.48	41.9	48.7	43.6	44.7	66	22	51.5	38.9	35.5	36.5	36.0	36.0	78	61	75	73
D..	29.944	30.69	29.12	32.3	38.4	34.2	35.0	59	14	42.0	27.9	25.7	28.4	26.0	26.7	76	68	72	72
Y..	29.964	30.78	29.00	46.0	52.9	46.5	48.5	92	1	56.2	40.8	39.3	41.2	39.5	40.0	78	66	77	74

Monthly and yearly meteorological summaries—Continued.

MYER, FORT, VA.

[$H=267$. $h=1$.]

Cloudiness (in tenths). 7 a. m.	3 p. m.	11 p. m.	Mean.	Wind. Total (miles).	Maximum.	Direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Precipitation. Total.	Max. 24 hours.	Number of days— Clear.	Fair.	Cloudy.	Rain or snow.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder-storms.	Auroras.	Months and year.
																In.	In.										
5.5	6.0	3.4	5.0	......	..	....	2	6	5	5	15	11	10	32	7	3.92	1.21	8	15	8	11	7	25	0	0	0	J.
5.9	4.8	5.2	5.8	5,488	42	NW.	9	7	12	8	8	1	5	34	5	4.21	2.18	8	9	11	12	14	27	0	0	0	F.
5.7	5.9	4.1	5.2	8,900	37	NW.	8	7	5	6	13	13	14	26	1	1.47	0.96	5	21	5	8	6	23	0	0	0	M.
4.0	4.9	3.7	4.2	7,097	50	NW.	9	10	12	5	19	10	7	18	0	1.33	0.45	10	16	4	9	0	4	0	2	0	A.
6.2	7.1	5.9	6.4	6,636	27	S.	12	6	28	6	10	6	7	19	0	2.61	1.25	5	13	13	12	0	0	0	1	0	M.
3.4	4.3	1.8	3.2	4,478	37	NW.	4	8	2	3	17	12	5	14	0	1.14	0.66	10	10	9	6	0	0	8	4	0	J.
4.2	5.7	2.9	4.3	3,454	26	NW.	8	10	5	8	10	13	6	8	2	2.38	0.68	5	14	2	7	0	0	9	3	0	J.
4.5	5.5	4.2	4.7	5,843	49	S.	8	4	4	9	20	17	9	21	1	7.29	2.56	9	15	7	10	0	0	3	5	0	A.
4.7	5.0	3.5	4.4	5,510	42	NW.	6	8	8	12	16	12	6	19	3	2.60	1.09	11	12	7	5	0	0	0	2	0	S.
4.8	5.5	3.7	4.7	6,580	41	E.	7	8	9	8	15	12	6	27	3	9.72	3.21	11	13	7	12	0	0	0	1	0	O.
6.1	6.6	5.8	6.2	8,258	30	NW.	7	4	1	0	11	18	9	39	1	3.40	1.18	8	16	11	10	0	6	0	0	0	N.
5.6	4.7	3.1	4.5	9,078	42	W.	16	9	4	3	5	19	11	29	3	2.57	1.14	8	20	3	6	0	20	0	0	0	D.
5.0	5.5	3.9	4.8	......	..	....	91	82	94	73	154	144	93	280	26	42.64	3.21	93	174	78	107	27	105	16	18	0	Y.

NASHVILLE, TENN.

[$H=549$. $h=79$.]

NEW HAVEN, CONN.

[$H=107$. $h=109$.]

NEW LONDON, CONN.

[$H=47$. $h=58$.]

Monthly and yearly meteorological summaries—Continued.

NEW ORLEANS, LA.

[Latitude, 29° 58' N.; longitude, 90° 4' W. Local time, 1.00 slow, Eastern.]

Months and year.	Pressure: Mean.	Pressure: Maximum.	Pressure: Minimum.	Temperature: 7 a.m.	Temperature: 3 p.m.	Temperature: 11 p.m.	Temperature: Mean.	Temperature: Maximum.	Temperature: Minimum.	Temperature: Mean Maximum.	Temperature: Mean Minimum.	Dew point: 7 a.m.	Dew point: 3 p.m.	Dew point: 11 p.m.	Dew point: Mean.	Relative humidity: 7 a.m.	Relative humidity: 3 p.m.	Relative humidity: 11 p.m.	Relative humidity: Mean.
	In.	In.	In.	°	°	°	°	°	°	°	°	°	°	°	°				
J ..	30.112	30.63	29.74	48.4	58.0	51.8	52.1	75	29	58.6	45.1	41.8	43.0	42.0	42.5	77	65	72	72
F ..	30.008	30.38	29.55	44.8	58.4	52.8	53.1	75	30	60.8	45.8	40.9	40.8	42.2	41.3	76	54	69	66
M ..	30.089	30.49	29.70	58.8	63.6	54.2	58.4	77	38	66.6	51.1	43.6	46.4	48.6	46.9	76	57	71	68
A ..	29.976	30.25	29.77	68.1	76.5	69.8	70.5	83	62	76.4	64.9	60.7	61.0	62.6	61.4	84	62	78	76
M ..	29.989	30.08	29.60	70.1	78.2	73.4	73.9	87	60	80.8	64.4	64.2	62.3	64.9	63.8	82	60	76	72
J ..	29.994	30.13	29.79	78.8	88.4	81.8	82.2	92	72	89.1	74.8	72.8	68.5	73.0	71.8	82	58	76	72
J ..	29.991	30.16	29.80	78.6	87.4	81.7	82.0	92	74	90.2	78.8	74.0	71.8	74.1	73.3	83	61	78	74
A ..	29.936	30.11	29.77	77.6	84.5	79.1	80.4	93	70	88.2	74.7	75.0	72.4	75.2	74.3	92	71	89	84
S ..	29.901	30.03	29.67	74.8	81.5	75.6	77.1	92	60	83.2	72.1	72.0	71.7	72.2	72.3	90	70	90	83
O ..	29.987	30.27	29.70	60.3	72.7	64.2	65.7	80	49	73.7	58.2	58.1	54.3	58.0	56.8	86	54	82	74
N ..	30.025	30.30	29.72	55.3	65.6	58.1	59.7	85	40	67.0	52.2	50.5	50.0	51.6	50.8	85	61	81	75
D ..	30.149	30.67	29.58	48.3	59.0	52.1	53.1	73	30	61.6	45.0	44.0	47.0	46.1	45.0	85	67	81	78
Y ..	30.004	30.53	29.55	62.4	72.4	66.5	67.4	93	29	74.0	60.0	56.1	57.0	58.3	58.4	83	62	79	75

NEW YORK CITY, N. Y.

[Latitude, 40° 43' N.; longitude, 74° W. Local time, 0.04 fast, Eastern.]

Months and year.	Pressure: Mean.	Pressure: Maximum.	Pressure: Minimum.	Temperature: 7 a.m.	Temperature: 3 p.m.	Temperature: 11 p.m.	Temperature: Mean.	Temperature: Maximum.	Temperature: Minimum.	Temperature: Mean Maximum.	Temperature: Mean Minimum.	Dew point: 7 a.m.	Dew point: 3 p.m.	Dew point: 11 p.m.	Dew point: Mean.	Relative humidity: 7 a.m.	Relative humidity: 3 p.m.	Relative humidity: 11 p.m.	Relative humidity: Mean.
J ..	29.917	30.65	29.12	27.7	31.8	28.0	29.2	60	5	37.6	22.2	23.3	26.5	23.5	24.4	82	80	82	82
F ..	29.796	30.30	28.90	20.0	27.0	22.4	23.1	61	0	31.8	19.1	14.6	10.4	17.6	17.2	78	73	80	78
M ..	29.889	30.31	29.36	25.6	34.0	28.5	29.7	56	0	37.9	22.5	19.6	23.6	22.7	22.0	77	64	76	72
A ..	29.850	30.44	29.29	42.0	54.4	45.8	47.7	81	27	58.8	39.7	35.0	38.3	36.7	36.7	74	57	72	68
M ..	29.813	30.11	29.44	52.8	61.6	54.3	56.2	85	39	64.7	48.8	45.2	48.0	47.7	47.0	77	65	80	74
J ..	29.832	30.12	29.26	63.0	74.5	64.6	67.3	91	51	76.0	59.0	55.9	57.1	65.2	60.1	79	56	72	69
J ..	29.848	30.04	29.55	70.5	80.0	72.0	74.2	96	56	83.5	67.4	63.7	64.5	63.6	64.6	80	61	81	74
A ..	29.819	30.11	29.53	67.6	76.0	68.8	70.8	90	51	78.8	64.2	62.1	61.7	62.2	62.3	83	63	83	76
S ..	29.900	30.23	29.16	59.9	70.1	62.3	64.1	84	43	73.4	57.1	51.0	53.1	54.7	53.0	78	56	77	70
O ..	29.853	30.13	29.03	51.7	59.8	53.0	54.5	76	34	62.7	47.9	40.4	45.7	47.1	40.4	84	63	81	76
N ..	29.703	30.17	29.40	41.5	49.1	43.7	44.6	69	25	52.5	39.2	35.2	35.7	37.6	33.5	79	62	74	71
D ..	29.831	30.55	28.92	33.5	39.1	35.3	36.0	60	14	44.4	28.4	25.1	27.6	26.7	26.5	72	64	71	69
Y ..	29.839	30.65	28.90	46.4	54.8	48.2	49.8	96	0	58.6	42.6	38.9	41.6	41.4	41.0	79	64	78	72

NORFOLK, VA.

[Latitude, 36° 51' N.; longitude, 76° 17' W. Local time, 0.03 slow, Eastern.]

Months and year.	Pressure: Mean.	Pressure: Maximum.	Pressure: Minimum.	Temperature: 7 a.m.	Temperature: 3 p.m.	Temperature: 11 p.m.	Temperature: Mean.	Temperature: Maximum.	Temperature: Minimum.	Temperature: Mean Maximum.	Temperature: Mean Minimum.	Dew point: 7 a.m.	Dew point: 3 p.m.	Dew point: 11 p.m.	Dew point: Mean.	Relative humidity: 7 a.m.	Relative humidity: 3 p.m.	Relative humidity: 11 p.m.	Relative humidity: Mean.
J ..	30.148	30.75	29.56	40.2	48.2	41.6	42.7	71	20	50.5	34.4	34.5	34.5	34.5	34.5	80	65	76	74
F ..	29.983	30.47	29.29	33.8	41.7	36.1	37.2	66	14	44.9	29.8	27.7	29.4	29.7	28.9	78	63	77	73
M ..	30.061	30.48	29.62	35.7	47.2	39.0	40.8	69	20	48.5	33.5	30.0	31.4	32.4	31.3	80	60	76	72
A ..	30.020	30.53	29.60	52.5	64.2	54.0	57.1	81	35	66.2	47.0	45.3	48.0	45.5	46.3	77	56	72	69
M ..	29.996	30.15	29.52	65.0	70.6	62.8	65.1	84	47	73.0	56.3	57.7	58.7	57.8	58.1	80	68	84	79
J ..	30.006	30.25	29.63	71.5	80.8	70.7	74.2	97	56	83.2	65.8	64.3	64.7	64.4	64.1	76	56	81	72
J ..	29.936	30.17	29.71	76.7	87.8	77.0	80.5	99	60	90.5	72.5	69.2	69.2	70.4	69.3	76	54	81	71
A ..	29.957	30.19	29.66	75.8	83.2	75.6	77.9	94	60	85.4	71.3	68.4	64.6	68.4	67.8	81	59	79	73
S ..	30.044	30.27	29.55	68.2	76.0	67.8	70.0	89	51	77.7	63.0	60.6	59.3	62.1	60.7	83	57	82	74
O ..	29.963	30.31	29.73	56.7	65.6	58.8	60.4	82	43	67.8	53.5	53.2	53.2	53.3	52.6	85	66	79	77
N ..	29.963	30.37	29.54	47.1	57.2	48.8	51.4	78	25	58.9	44.5	42.0	41.3	43.6	42.0	83	61	80	75
D ..	30.028	30.67	29.32	38.2	48.6	41.7	43.2	69	22	52.1	34.3	32.2	33.9	32.3	33.1	79	60	79	76
Y ..	30.006	30.75	29.29	54.7	64.1	56.4	58.4	99	14	66.6	50.7	48.8	48.4	49.4	49.2	81	61	79	73

NORTH PLATTE, NEBR.

[Latitude, 41° 8' N.; longitude, 100° 45' W. Local time, 1.43 slow, Eastern.]

Monthly and yearly meteorological summaries—Continued.

NEW ORLEANS, LA.

[H=52. h=77.]

Cloudiness (in tenths).				Wind.												Precipitation.		Number of days—									
7 a. m.	3 p. m.	11 p. m.	Mean.	Total (miles).	Maximum.	Direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Total.	Max. 24 hours.	Clear.	Fair.	Cloudy.	Rain or snow.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder-storms.	Auroras.	Months and year.
																In.	In.										
6.5	6.5	4.3	5.4	6,644	25	NW.	14	24	15	7	9	12	3	8	1	9.70	2.62	7	13	11	15	0	3	0	4	0	J.
4.8	5.3	4.6	4.8	5,801	26	NW.	21	12	8	7	10	10	4	9	3	2.89	0.84	11	9	8	9	0	1	0	1	0	F.
4.6	5.4	4.6	4.9	5,155	20	SW.	19	16	18	8	8	11	1	9	3	6.99	2.24	10	13	8	9	0	0	0	1	0	M.
5.3	5.7	3.9	5.0	5,742	26	SE.	7	14	15	27	12	5	3	5	2	3.67	1.05	7	17	6	10	0	0	0	2	0	A.
5.6	6.2	3.3	4.7	4,538	28	NE.	6	11	13	31	4	10	7	6	5	6.77	1.38	7	17	7	15	0	0	0	8	0	M.
3.3	5.1	1.6	3.3	3,467	21	S.	10	7	8	20	11	10	5	7	3	3.30	0.69	10	20	0	12	0	0	11	7	0	J.
2.9	5.5	2.9	3.8	3,517	24	SE.	4	6	12	33	8	15	7	4	4	6.15	1.98	8	23	0	20	0	0	17	14	0	J.
5.2	6.3	2.5	4.7	3,914	26	SE.	6	11	19	11	4	21	7	9	5	4.25	1.05	6	22	3	18	0	0	16	9	0	A.
5.7	7.4	4.1	5.7	4,605	28	N.	6	25	17	14	5	2	9	10	2	13.55	3.23	4	16	10	17	0	0	5	8	0	S.
3.2	3.9	2.6	[illegible]	5,247	23	NW.	20	15	12	7	6	4	14	13	2	0.56	0.40	16	12	3	3	0	0	0	0	0	O.
4.5	2.8	3.2	3.8	5,001	24	N., S.	25	7	5	17	8	7	5	12	4	3.47	1.35	13	12	5	6	0	0	0	1	0	N.
3.9	4.2	2.9	3.7	5,813	29	SE.	19	10	17	16	2	9	6	13	1	4.88	3.40	17	7	7	8	0	1	0	1	0	D.
4.5	5.4	3.4	4.4	59,504	...	....	157	158	159	198	87	125	71	105	35	64.18	3.40	116	181	68	142	0	5	49	56	0	Y.

NEW YORK CITY, N. Y.

[H=164. h=145.]

NORFOLK, VA.

[H=30. h=52.]

NORTH PLATTE, NEBR.

[H=2,841. h=34.]

Monthly and yearly meteorological summaries—Continued.

OLYMPIA, WASH.

[Latitude, 47° 3′ N.; longitude, 122° 53′ W. Local time, 3.11 slow, Eastern.]

OMAHA, NEBR.

[Latitude, 41° 16′ N.; longitude, 95° 56′ W. Local time, 1.24 slow, Eastern.]

J ..	28.975	29.48	28.29	7.4	16.5	12.6	12.2	50	-18	21.7	3.3	1.4	7.6	7.8	5.6	76	68	81	75
F ..	28.881	29.29	28.39	11.8	21.4	16.7	16.6	..	-18	....	8.9	6.5	11.1	11.8	9.8	79	64	80	74
M .	28.938	29.28	28.57	29.5	42.7	36.1	36.1	66	9	46.6	27.3	24.1	25.6	28.6	26.1	80	52	74	69
A ..	28.803	29.17	28.44	43.9	65.8	50.7	50.1	77	28	59.9	42.1	38.5	41.1	42.6	40.6	62	60	75	72
M .	28.788	29.12	28.46	53.0	66.5	59.9	59.8	80	29	69.9	60.8	47.7	46.8	49.2	47.0	81	51	69	67
J ..	28.836	29.14	28.41	65.4	77.7	70.8	71.1	94	49	81.9	62.7	60.5	61.1	62.2	61.3	84	57	76	72
J ..	28.806	29.06	28.49	71.1	84.0	75.8	77.0	98	55	87.2	68.3	66.0	66.2	68.7	67.0	84	60	79	74
A ..	28.850	29.15	28.55	63.8	76.6	69.3	69.9	91	50	79.1	61.8	60.1	63.0	63.9	62.3	88	63	83	76
S ..	28.849	29.20	28.37	57.8	71.8	64.0	64.5	89	45	74.0	56.8	53.8	55.2	57.6	55.5	87	58	80	75
O ..	28.863	29.19	28.57	42.6	57.6	49.2	49.8	75	30	60.0	41.0	38.6	39.8	41.4	39.8	86	53	76	72
N ..	28.822	29.17	28.18	35.2	45.7	38.9	39.9	63	21	48.3	32.2	32.3	34.8	34.7	33.9	69	66	85	80
D ..	28.912	29.35	28.36	24.0	33.4	28.3	28.6	60	-4	37.3	20.6	20.5	25.8	23.3	23.2	86	74	82	81
Y .	28.860	29.48	28.13	42.1	54.1	47.6	47.0	98	-18	....	39.6	37.5	40.0	41.0	39.6	84	61	76	74

OSWEGO, N. Y.

[Latitude, 43° 29′ N.; longitude, 76° 35′ W. Local time, 0.06 slow, Eastern.]

J ..	29.660	30.31	28.84	19.0	22.2	20.9	20.5	61	-23	28.8	11.2	14.2	16.9	14.3	14.8	82	77	78	79
F ..	29.592	30.09	28.89	8.0	16.2	13.3	12.7	37	-	21.6	2.2	6.7	11.6	9.8	9.4	92	82	96	86
M .	29.639	30.07	29.07	15.8	21.9	18.4	18.7	49	-10	25.9	11.7	11.9	14.0	12.6	12.9	85	72	79	79
A ..	29.657	30.17	29.12	38.5	41.5	37.3	38.4	85	17	46.5	30.6	29.0	30.7	30.1	29.9	75	67	76	73
M .	29.596	29.85	29.23	49.8	56.2	51.4	52.5	81	28	60.5	43.3	42.0	43.1	42.2	42.4	75	64	72	71
J ..	29.603	29.91	29.15	57.5	63.3	58.5	59.8	85	30	69.9	50.5	50.4	49.5	50.9	50.3	78	63	77	73
J ..	29.562	29.82	29.33	64.9	70.1	65.1	66.7	90	45	74.4	59.1	58.7	59.1	59.8	59.2	81	69	84	78
A ..	29.596	29.85	29.17	61.1	66.4	62.2	63.2	83	47	69.5	56.7	55.6	55.7	55.4	55.5	82	70	79	77
S ..	29.662	29.96	29.13	55.0	62.9	56.1	58.0	79	40	66.6	49.8	48.4	50.1	48.8	49.1	79	64	78	74
O ..	29.627	29.93	29.14	44.7	51.6	46.7	47.7	72	29	55.1	40.9	39.2	41.2	39.9	40.1	82	69	78	77
N .	29.547	29.99	29.20	38.1	42.3	39.5	40.0	71	15	45.4	33.9	32.5	33.4	33.5	33.1	81	72	80	78
D .	29.597	30.34	28.76	27.1	30.6	29.1	28.9	55	7	36.6	21.9	21.6	24.2	23.5	23.1	80	77	79	79
Y ..	29.612	30.34	28.76	39.8	45.4	41.5	42.2	90	....	50.1	34.3	34.2	35.7	35.1	35.0	81	71	79	77

PALESTINE, TEX.

[Latitude, 31° 46′ N.; longitude, 95° 40′ W. Local time, 1.22 slow, Eastern.]

J ..	29.636	30.18	29.17	36.7	46.9	42.2	41.9	73	11	60.6	34.0	31.5	32.2	32.0	32.2	82	59	71	71
F ..	29.527	29.92	29.07	38.4	52.1	46.4	45.6	77	15	57.1	30.1	31.2	30.6	32.8	31.5	76	48	62	62
M .	29.507	29.94	29.21	47.9	61.7	54.2	54.6	79	31	65.1	45.4	42.2	41.2	41.6	41.7	81	50	63	65
A ..	29.461	29.79	29.20	60.0	74.9	66.0	67.0	86	47	77.4	58.8	56.0	58.0	57.5	57.2	87	58	76	74
M .	29.408	29.63	29.14	62.6	77.2	68.1	69.4	87	51	79.6	61.2	59.3	62.0	62.3	61.2	89	60	83	77
J ..	29.468	29.64	29.29	72.9	86.1	76.5	78.5	92	63	80.4	70.9	71.1	73.3	72.1	72.2	94	66	87	82
J ..	......	.....	.....	....	...	....	..	.	..	....	..	.....	.....	....	....	..	..	..	.
A ..	29.447	29.60	29.29	74.0	89.5	78.8	80.0	97	64	91.6	73.2	71.2	72.8	73.2	72.2	92	60	84	79
S ..	29.442	29.60	29.30	69.4	82.5	72.5	74.8	93	58	84.8	68.0	66.2	68.4	68.1	67.6	90	64	88	81
O ..	29.506	29.88	29.22	54.9	71.2	60.2	62.1	83	39	73.3	52.6	49.9	52.0	52.8	51.6	84	53	78	71
N ..	29.521	29.82	29.01	51.6	65.9	56.3	57.9	83	35	68.4	49.7	43.7	44.7	46.8	45.1	76	50	73	69
D ..	29.622	29.93	28.90	44.6	57.8	49.5	50.6	78	24	61.4	42.1	38.2	42.9	41.2	40.8	79	60	74	71
Y ..	....	......	....	.....	.....	....	......	...	11	....	.....	....	....	.....	.....	...	...	.	...

Monthly and yearly meteorological summaries—Continued.

OLYMPIA, WASH.

[H=36. h=36.]

OMAHA, NEBR.

[H=1,113. h=71.]

OSWEGO, N. Y.

[H=335. h=63.]

PALESTINE, TEX.

[H=533, h=2.]

5.7	5.8	4.6	5.4	8,085	32	NW., SW.	15	24	6	4	16	6	0	14	0	7.77	3.42	8	14	9	10	2	14	0	2	0	J.
5.5	4.3	3.7	4.5	7,654	31	S.	14	21	3	1	25	5	1	14	0	8.02	2.44	12	9	7	6	1	10	0	6	0	F.
5.1	5.8	4.8	5.2	7,290	25	NW.	22	15	7	7	29	5	2	6	0	2.25	1.11	9	11	11	11	0	1	0	1	0	M.
6.5	5.7	4.5	5.6	7,574	40	NE.	10	12	9	20	25	6	1	7	0	5.14	2.09	7	14	9	11	0	0	0	4	0	A.
6.1	5.6	2.9	5.2	5,581	44	W.	20	13	6	8	23	3	2	17	1	6.08	2.59	6	15	8	11	0	0	0	9	0	M.
4.5	4.7	2.9	4.0	5,680	32	NW.	3	7	8	12	40	6	2	1	0	2.07	0.80	10	14	4	8	0	0	11	8	0	J.
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	J.
4.5	5.4	1.8	3.9	5,629	29	S.	15	13	5	10	31	17	1	1	0	1.87	0.64	12	19	0	8	0	0	16	4	0	A.
3.7	6.0	3.1	4.9	5,891	28	SW.	16	27	7	6	26	3	1	4	0	4.63	1.69	11	11	8	11	0	0	4	5	0	S.
3.4	4.3	2.1	3.3	6,547	30	S.	14	10	4	3	30	7	5	20	0	1.47	0.94	18	7	6	5	0	0	0	1	0	O.
4.3	4.2	3.1	3.9	6,923	32	S.	10	12	4	4	30	8	6	14	0	3.48	2.51	15	9	6	8	0	0	0	3	0	N.
4.8	4.7	2.8	4.3	7,367	52	NW.	11	2	10	11	18	15	5	20	1	3.14	1.64	11	14	6	6	0	5	0	0	0	D.
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3.42	...	...	...	...	...	...	...	...	...	Y.

Monthly and yearly meteorological summaries—Continued.

PENSACOLA, FLA.

[Latitude, 30° 25' N.; longitude, 87° 13' W. Local time, 0.49 slow, Eastern.]

Months and year.	Pressure.			Temperature.								Dew point.				Relative humidity.			
										Mean.									
	Mean.	Maximum.	Minimum.	7 a.m.	3 p.m.	11 p.m.	Mean.	Maximum.	Minimum.	Maximum.	Minimum.	7 a.m.	3 p.m.	11 p.m.	Mean.	7 a.m.	3 p.m.	11 p.m.	Mean.
	In.	In.	In.	°	°	°	°	°	°	°	°	°	°	°	°				
J..	30.150	30.60	29.80	46.0	55.9	50.1	50.7	70	24	58.6	42.8	40.1	41.8	41.8	41.1	81	63	74	73
F..	30.039	30.42	29.56	44.6	58.7	50.7	50.7	69	24	59.1	42.6	37.1	40.8	39.7	39.2	77	60	66	68
M..	30.118	30.50	29.76	48.9	61.1	54.6	54.6	77	31	62.0	47.8	42.6	45.8	44.4	45.0	81	61	76	72
A..	30.038	30.32	29.79	62.7	72.5	65.8	67.0	84	42	74.0	61.2	57.2	58.5	58.5	58.4	84	64	82	76
M..	29.930	30.09	29.64	68.7	78.3	71.3	72.8	86	54	80.5	66.7	62.3	63.3	63.4	63.0	81	62	77	73
J..	30.020	30.16	29.80	76.9	86.0	78.6	80.5	90	67	86.7	74.2	71.1	72.1	72.1	71.8	83	64	81	76
J..	30.018	30.20	29.80	78.2	86.1	80.4	81.6	92	69	89.1	75.1	72.4	74.4	72.3	73.0	88	69	78	77
A..	29.962	30.14	29.74	77.4	85.0	80.0	80.6	93	72	88.6	75.4	74.4	75.5	74.1	74.7	91	74	83	83
S..	29.937	30.09	29.72	74.7	83.2	77.0	78.3	89	65	84.3	73.8	70.1	72.3	72.3	72.2	89	73	86	83
O..	29.977	30.24	29.08	59.2	71.6	63.4	64.7	81	43	73.1	57.1	52.5	56.6	53.6	54.3	79	61	72	71
N..	30.046	30.26	29.77	53.0	63.2	55.7	57.3	76	33	65.5	48.9	45.8	50.8	48.5	48.2	77	66	76	73
D..	30.174	30.52	29.74	44.4	57.1	50.0	50.5	69	28	58.4	42.1	38.6	42.7	41.0	39.8	73	64	72	70
Y..	30.035	30.52	29.56	61.2	71.4	64.8	65.8	93	24	72.7	58.0	55.2	57.6	57.0	56.7	82	66	77	75

PHILADELPHIA, PA.

[Latitude, 39° 57' N.; longitude, 75° 9' W. Local time, 0.00, Eastern.]

J..	30.000	30.73	29.21	27.0	32.8	29.1	29.6	64	6	35.2	22.2	19.9	20.0	20.6	20.0	72	61	70	68
F..	29.989	30.40	28.97	20.3	26.9	23.1	23.4	56	0	31.5	....	12.0	16.4	15.6	15.8	71	71	73	71
M..	29.979	30.36	29.47	26.2	35.9	30.2	30.8	61	6	38.6	23.1	17.6	22.1	21.0	20.5	68	60	71	67
A..	29.915	30.46	29.39	44.0	58.1	47.4	49.8	87	27	60.9	40.4	30.0	41.6	38.3	36.6	74	57	72	68
M..	29.843	30.19	29.46	54.6	67.0	57.3	59.6	84	41	69.6	51.2	47.5	49.4	48.8	48.6	79	64	75	70
J..	29.890	30.16	29.36	65.9	79.1	66.9	70.6	93	52	80.6	61.3	55.2	54.1	55.2	54.8	70	44	66	60
J..	29.850	30.00	29.61	71.7	85.5	74.5	77.2	97	57	87.8	66.6	63.4	62.1	64.6	63.4	76	46	72	65
A..	29.967	30.15	29.52	67.7	78.2	69.4	71.8	91	51	81.6	64.9	62.2	61.1	62.8	62.0	83	57	80	74
S..	29.959	30.26	29.35	60.0	72.0	62.6	65.2	85	44	75.8	57.6	52.8	52.2	54.6	53.5	79	52	76	69
O..	29.902	30.21	28.99	50.7	60.6	53.2	54.8	74	33	63.4	47.4	46.2	44.6	47.6	46.8	83	62	81	76
N..	29.937	30.25	29.50	41.5	49.5	43.9	45.0	71	29	51.0	38.1	35.5	37.5	37.6	36.9	80	65	79	75
D..	29.914	30.64	29.14	33.2	40.4	36.4	36.7	60	15	44.6	29.6	25.5	26.3	28.4	26.7	73	56	73	68
Y..	29.930	30.73	28.97	47.0	57.2	49.5	51.2	97	0	60.3	...	39.6	41.0	41.6	40.6	76	57	74	69

PIKE'S PEAK, COLO.

[Latitude, 38° 50' N.; longitude 105° 2' W. Local time, 2.00 slow, Eastern.]

J..	17.408	17.84	17.11	0.3	2.4	1.1	1.4	21	−29	6.7	−5.0	−4.7	−4.4	−3.8	−4.3	81	71	79	77
F..	17.453	17.88	17.00	1.1	4.8	1.0	1.9	16	−24	7.6	−3.6	−4.3	0.8	−2.2	−2.2	83	83	[illegible]	[illegible]
M..	17.670	17.87	17.44	6.6	12.8	8.6	9.3	23	−12	14.7	4.1	2.2	5.9	4.2	4.1	83	75	[illegible]	[illegible]
A..	17.670	17.89	17.14	12.6	19.5	15.4	15.8	28	− 5	21.6	11.1	9.4	16.7	12.0	13.0	87	80	[illegible]	[illegible]
M..	17.777	17.99	17.67	17.6	24.8	21.0	21.1	39	10	26.6	16.8	14.2	21.8	18.8	18.3	88	88	91	[illegible]
J..	17.947	18.13	17.51	26.2	33.9	29.3	29.8	44	24	36.7	25.0	21.4	27.5	25.2	24.7	82	78	83	81
J..	18.002	18.21	17.84	35.4	44.6	37.7	39.2	57	24	47.0	34.0	29.5	35.8	33.6	32.9	79	73	83	79
A..	18.000	18.22	17.90	33.3	42.2	35.7	37.1	52	16	42.9	32.7	30.8	31.7	32.2	31.6	84	73	88	83
S..	17.968	18.19	17.65	27.2	35.8	30.1	31.0	47	10	38.1	26.1	22.6	27.6	24.6	25.0	82	73	81	79
O..	17.830	18.03	17.50	18.0	24.7	20.9	21.2	38	− 1	26.8	16.8	14.2	18.6	15.9	16.2	82	79	81	81
N..	17.694	18.05	17.10	11.8	16.6	12.9	13.8	33	− 8	18.4	8.2	8.0	13.1	9.3	9.8	85	83	[illegible]	84
D..	17.840	18.11	17.18	7.5	10.8	8.0	8.8	26	−20	14.6	2.6	2.9	7.1	4.3	4.8	82	83	86	84
Y..	17.778	18.22	17.00	16.8	22.8	18.6	19.2	57	−29	25.2	14.1	11.9	18.8	14.6	14.6	83	78	83	[illegible]

PITTSBURG, PA.

[Latitude, 40° 32' N.; longitude, 80° 2' W. Local time, 0.20 slow, Eastern.]

Monthly and yearly meteorological summaries—Continued.

PENSACOLA, FLA.

[H=30. h=35.]

PHILADELPHIA, PA.

[H=117. h=166.]

PIKE'S PEAK, COLO.

[H=14.134. h=1.]

PITTSBURG, PA.

[H=766. h=86.]

5.9	7.4	4.6	5.9	5,809	32	W.	2	6	9	4	14	16	20	20	3	4.03	1.24	5	15	11	10	11	23	0	0	0	J.
7.7	7.6	5.7	7.0	4,768	26	W.	8	7	5	3	8	12	21	16	4	1.90	0.46	2	12	13	20	12	25	0	0	0	F.
7.1	7.2	6.4	6.9	5,269	25	S.	16	4	4	1	12	12	17	20	7	1.14	0.31	3	15	13	20	8	25	0	0	0	M.
6.4	5.8	5.5	5.9	4,098	23	{NW., SW.}	6	6	9	[illegible]	10	10	10	10	16	2.70	0.74	9	8	13	15	0	9	0	3	0	A.
6.0	7.1	5.6	6.2	4,071	21	S.	10	9	11	10	9	9	11	11	13	3.26	1.26	6	10	9	15	0	0	0	4	0	M.
4.1	6.0	1.9	4.0	4,116	23	S.	14	4	2	3	15	7	7	20	9	2.08	1.43	11	18	1	13	0	0	3	6	0	J.
5.7	5.6	3.2	4.8	3,708	26	S.	14	2	4	3	14	12	9	25	10	2.49	0.80	8	16	7	12	0	0	15	11	0	J.
5.8	6.6	3.0	5.4	3,705	23	S.	10	6	7	3	11	12	9	22	13	5.64	2.61	5	18	8	14	0	0	6	14	0	A.
4.4	5.3	3.0	4.2	2,916	25	NW.	8	6	3	2	13	9	9	11	29	1.09	0.90	13	10	7	8	0	0	0	2	0	S.
5.4	6.8	4.2	5.5	2,853	22	S.	6	3	8	5	12	5	11	14	29	4.29	1.32	9	14	8	16	0	0	0	1	0	O.
7.0	8.7	7.0	7.9	4,000	24	S.	4	3	5	4	15	12	10	27	4	2.57	0.99	1	9	20	17	0	7	0	0	0	N.
7.4	8.1	6.9	7.5	6,013	28	SW.	5	6	5	6	17	27	15	11	1	1.64	0.58	4	8	19	17	4	17	0	0	0	D.
6.2	6.8	4.8	5.9	52,228	..	....	103	61	72	48	150	143	156	225	138	34.12	2.61	77	150	129	186	35	106	24	41	0	Y.

Monthly and yearly meteorological summaries—Continued.

POPLAR RIVER, MONT.

[Latitude, 48° 8′ N.; longitude, 105° 10′ W. Local time, 2.00 slow, Eastern.]

Months and year.	Pressure.			Temperature.								Dew point.				Relative humidity.			
	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	Mean. Maximum.	Mean. Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.
	In.	In.	In.	°	°	°	°	°	°	°	°	°	°	°	°				
J..	27.880	28.43	27.28	-11.9	- 0.5	- 1.1	- 4.5	37	-63	7.6	-16.1	-12.8	- 2.1	- 2.5	- 5.8	95	93	93	94
F..	27.851	28.28	27.19	- 6.5	7.6	1.0	0.7	40	-50	11.6	-10.3	- 7.8	5.8	0.3	0.9	94	91	94	93
M.	27.937	28.27	27.60	19.0	31.9	27.0	26.0	53	- 1	36.2	17.0	17.1	28.7	25.7	23.8	92	88	95	92
A..	27.804	28.18	27.33	34.0	55.3	40.6	43.3	77	18	58.2	32.2	30.8	43.2	36.6	36.9	88	66	86	80
M.	27.785	28.16	27.49	43.0	66.6	52.8	54.1	87	22	60.6	38.9	38.4	49.8	45.6	44.6	85	58	78	73
J..	27.829	28.21	26.27	56.4	72.8	61.3	63.5	94	36	77.5	50.0	52.6	62.4	57.7	57.6	87	71	88	82
J..	27.778	28.09	27.40	57.3	77.8	64.8	66.6	95	42	82.1	53.2	52.2	62.4	58.1	57.6	84	61	80	75
A..	27.914	28.18	27.65	50.8	71.8	58.6	60.4	91	36	74.3	47.7	47.5	54.6	53.0	51.7	89	57	83	76
S..	27.709	28.16	27.35	40.4	69.2	53.6	54.4	91	24	72.7	38.2	36.2	51.6	44.1	44.0	85	58	73	72
O..	27.866	28.20	27.41	28.2	56.3	39.5	41.3	82	9	59.4	26.9	23.7	32.4	30.5	28.9	82	43	72	66
N..	27.771	28.13	27.37	24.8	41.7	30.1	32.2	55	10	.....	21.4	21.1	32.7	24.9	26.2	85	71	80	79
D..	27.825	28.29	27.31	11.9	28.0	18.6	19.5	61	-15	31.6	8.9	6.0	20.2	12.9	13.0	77	73	78	76
Y..	27.837	28.43	27.19	29.0	48.2	37.2	38.1	95	-63	66.2	25.7	25.4	36.8	32.2	31.5	87	69	83	80

PORT ANGELES, WASH.

[Latitude, 48° 7′ N.; longitude, 123° 6′ W. Local time, 3.14 slow, Eastern.]

Months and year.	Pressure.			Temperature.								Dew point.				Relative humidity.			
	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	Mean. Maximum.	Mean. Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.
J..	....	.....	......	.....	.....	.....	.....	52	24	41.4	31.2	......	......	......	......	...	...	...	...
F..	30.005	30.46	29.57	38.4	47.0	42.8	42.7	58	28	49.8	36.4	36.5	42.3	40.0	39.6	92	84	90	89
M.	30.166	30.51	29.84	38.8	49.8	45.5	44.7	58	30	53.3	36.6	37.2	45.1	43.0	41.8	94	85	91	9.
A..	30.044	30.28	29.76	37.1	52.2	46.4	45.2	67	30	55.2	35.9	35.3	44.5	42.1	40.6	93	76	85	85
M.	29.941	30.17	29.65	44.3	55.2	51.8	50.4	72	35	58.4	43.1	42.8	49.7	48.5	47.0	94	82	88	88
J..	29.999	30.23	29.69	48.8	58.1	55.8	54.2	69	37	61.2	48.0	46.5	50.7	50.2	49.1	92	77	82	83
J..	30.003	30.24	29.77	50.9	64.0	59.4	58.1	82	44	67.8	49.9	48.9	53.3	53.3	51.8	93	70	81	81
A..	29.909	30.22	29.74	49.4	60.6	56.2	55.4	74	43	64.6	48.1	47.9	54.0	52.2	51.4	94	79	87	87
S..	29.910	30.19	29.53	48.3	56.8	53.5	52.9	67	38	60.4	46.7	47.2	53.4	51.6	50.7	96	89	93	93
O..	29.993	30.28	29.64	42.3	52.8	46.5	47.2	64	30	55.6	39.3	41.4	47.6	45.3	44.8	97	83	96	92
N..	29.720	30.17	29.05	40.1	47.3	41.3	42.9	55	26	49.4	34.6	39.3	43.8	40.2	41.1	97	88	96	94
D..	30.000	30.48	29.47	38.0	43.8	38.9	40.2	53	14	45.5	30.6	37.3	40.3	38.0	38.5	97	88	97	94
Y..	....	......	......	.....	.....	.....	.....	...	...	55.2	40.0	......	......	......	......	...	...	...	...

PORT HURON, MICH.

[Latitude, 43° 0′ N.; longitude, 82° 26′ W. Local time, 0.30 slow, Eastern.]

Months and year.	Pressure.			Temperature.								Dew point.				Relative humidity.			
	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	Mean. Maximum.	Mean. Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.
J..	29.352	29.93	28.53	13.0	19.7	16.1	16.3	49	-15	23.8	7.8	8.5	13.2	11.9	11.2	82	76	84	81
F..	29.268	29.83	28.48	4.9	15.8	11.0	10.6	42	-25	20.3	- 0.4	0.8	10.2	7.7	6.2	83	79	86	83
M.	29.338	29.74	28.66	14.1	23.1	18.5	18.6	46	-14	27.8	9.3	9.8	15.2	14.3	13.1	83	73	84	80
A..	29.342	29.70	28.76	36.1	43.4	38.5	39.3	80	15	48.7	32.1	31.9	32.1	31.8	31.9	85	66	78	76
M.	29.239	29.50	28.84	45.8	56.0	48.2	50.0	81	26	59.7	42.2	41.3	43.3	42.2	42.3	84	65	81	77
J..	29.324	29.59	28.99	57.6	67.6	60.4	61.9	86	40	72.5	52.4	52.2	54.2	53.5	53.3	83	63	79	75
J..	29.284	29.55	29.05	65.5	75.4	66.9	69.3	90	52	78.6	61.7	60.6	62.2	60.8	61.2	84	65	81	77
A..	29.288	29.61	28.73	58.7	68.6	61.8	63.0	82	45	71.4	55.4	54.4	58.5	56.4	56.4	86	71	83	80
S..	29.352	29.61	28.84	53.2	66.4	57.3	59.0	86	39	68.4	50.4	49.5	53.9	51.9	51.8	87	66	82	78
O..	29.288	29.65	28.73	42.7	51.5	45.0	46.4	71	25	54.4	39.8	39.6	43.1	42.0	41.6	89	74	89	84
N..	29.235	29.68	28.82	36.8	41.1	38.3	38.7	66	27	43.8	33.6	33.0	34.7	34.8	34.2	86	78	87	84
D..	29.292	29.97	28.47	25.6	30.3	27.5	27.8	49	- 2	34.1	21.8	22.2	23.7	23.9	23.3	86	76	86	83
Y..	29.300	29.97	28.47	37.8	46.6	40.8	41.7	90	-25	50.3	33.8	33.6	37.0	35.9	35.5	85	71	83	80

PORTLAND, ME.

[Latitude, 43° 39′ N.; longitude, 70° 15′ W. Local time, 0.19 fast, Eastern.]

Months and year.	Pressure.			Temperature.								Dew point.				Relative humidity.			
	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	Mean. Maximum.	Mean. Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.
J..	29.941	30.72	29.11	21.4	28.2	23.3	24.3	52	- 3	33.8	16.7	14.6	17.9	14.5	15.7	75	65	69	70
F..	29.851	30.31	28.83	14.9	26.3	19.8	20.3	46	- 5	30.9	12.0	16.3	15.3	11.1	10.9	69	64	68	67
M.	29.904	30.46	29.27	22.4	33.5	26.3	27.4	52	1	38.8	19.7	14.1	19.3	16.4	16.6	70	56	65	64
A..	29.913	30.47	29.38	42.4	52.2	43.7	46.1	72	28	53.3	38.4	33.4	34.8	34.3	34.2	71	54	70	65
M.	29.943	30.30	29.48	51.2	61.3	52.0	54.8	82	35	64.2	47.1	42.9	45.4	44.2	44.2	74	58	76	69
J..	29.852	30.18	29.30	62.1	71.9	62.0	65.3	90	47	75.4	56.4	52.3	55.3	52.9	53.5	71	58	73	68
J..	29.832	30.12	29.50	66.2	72.2	64.4	67.6	87	54	76.2	59.7	60.4	60.1	59.4	60.0	83	68	85	78
A..	29.850	30.14	29.47	62.2	68.6	61.6	64.1	85	47	71.5	57.0	56.3	58.6	57.2	57.4	82	72	86	80
S..	29.898	30.26	29.04	53.8	62.9	54.4	57.0	82	38	65.8	47.5	47.5	50.7	49.9	49.4	80	66	85	77
O..	29.917	30.27	29.13	44.1	52.5	45.9	47.5	68	30	54.9	40.9	40.7	43.7	42.7	42.4	88	75	89	84
N..	29.798	30.28	29.41	35.8	42.2	37.2	38.4	55	20	44.2	33.2	31.2	34.5	32.9	32.9	83	76	84	81
D..	29.800	30.57	28.86	24.7	30.3	26.6	27.2	55	7	34.6	19.6	19.3	21.8	21.0	20.7	80	71	79	77
Y..	29.876	30.72	28.83	41.8	50.2	43.1	45.0	90	- 5	53.8	37.4	35.0	38.1	36.4	36.5	77	65	78	73

Monthly and yearly meteorological summaries—Continued.

POPLAR RIVER, MONT.

[H=20.30. h=1.]

Cloudiness (in tenths): 7 a. m.	3 p. m.	11 p. m.	Mean.	Wind: Total (miles).	Maximum.	Direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Precipitation: Total.	Max. 24 hours.	Number of days—Clear.	Fair.	Cloudy.	Rain or snow.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder-storms.	Auroras.	Months and year.
																In.	*In.*										
5.0	5.6	5.0	5.2	3,095	33	N.	24	5	6	0	0	1	30	9	18	0.81	0.30	10	10	11	13	27	31	0	0	1	J.
5.2	4.8	4.0	4.7	2,952	26	W.	2	3	11	2	1	1	34	7	23	0.64	0.28	11	8	9	8	22	28	0	0	1	F.
6.1	5.8	4.7	5.5	5,256	43	W.	21	10	5	3	4	1	31	14	4	0.02	0.02	6	17	8	1	9	29	0	0	1	M.
4.4	5.0	4.1	4.5	6,964	41	{W. N., W.}	18	7	3	7	8	6	27	14	0	0.77	0.27	11	13	6	10	0	15	0	0	0	A.
2.6	4.8	3.0	3.5	5,810	34	NW.	28	3	8	9	11	2	19	11	2	0.77	0.25	17	12	2	9	0	8	0	1	0	M.
3.9	5.0	3.9	4.3	5,323	32	SE., E.	9	5	22	19	11	8	8	6	2	4.51	1.46	9	18	3	11	0	0	4	4	0	J.
4.2	4.0	3.5	3.9	5,997	60	N.	14	1	7	8	2	3	19	8	1	3.05	2.76	10	9	2	5	0	0	3	1	0	J.
3.9	4.6	3.8	4.1	3,803	29	N.	14	10	10	16	2	4	10	8	1	0.42	0.24	10	10	5	6	0	0	1	1	0	A.
3.1	3.4	2.2	2.9	4,882	36	N.	13	9	3	13	8	13	21	10	0	0.15	0.10	19	10	1	4	0	4	2	0	2	S.
4.9	3.7	3.3	4.0	5,309	34	NW.	11	10	2	3	5	9	21	29	3	0.09	0.07	13	13	5	3	0	24	0	0	3	O.
7.2	6.6	3.6	5.8	2,983	36	N.	8	10	10	10	2	5	15	7	7	0.29	0.20	3	13	7	4	0	22	0	0	0	N.
7.5	6.6	5.3	6.5	4,024	56	NW.	15	5	3	7	2	6	32	17	6	0.41	0.17	5	12	14	7	13	31	0	0	0	D.
4.8	5.0	3.9	4.6	56,398	..	....	177	78	90	97	56	59	267	140	67	11.93	2.76	124	145	73	81	71	192	10	7	8	Y.

PORT ANGELES, WASH.

[H=14. h=1.]

Cloudiness (in tenths): 7 a. m.	3 p. m.	11 p. m.	Mean.	Wind: Total (miles).	Maximum.	Direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Precipitation: Total.	Max. 24 hours.	Number of days—Clear.	Fair.	Cloudy.	Rain or snow.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder-storms.	Auroras.	Months and year.
...	...	...	...	......	..	....	..	...	...	...	...	...	...	...	..	8.17	2.36	...	...	...	19	0	16	0	0	0	J.
7.7	7.3	6.9	7.3	......	..	....	1	4	11	9	4	7	21	2	25	3.64	0.68	4	7	17	19	0	4	0	0	0	F.
5.3	5.4	2.2	4.3	......	..	....	6	6	6	6	16	5	11	3	34	0.68	0.40	13	12	6	8	0	3	0	0	1	M.
2.4	4.1	2.2	2.9	3,045	30	W.	4	9	3	0	24	10	23	8	9	0.71	0.46	19	8	3	5	0	10	0	0	1	A.
6.1	6.1	5.1	5.8	4,142	23	NW.	1	4	4	3	26	6	18	29	2	1.47	0.51	9	10	12	9	0	0	0	0	0	M.
6.2	5.3	5.3	5.6	5,195	28	NW.	2	2	2	1	20	11	13	36	3	0.67	0.40	6	18	6	7	0	0	0	0	0	J.
3.5	2.9	3.1	3.2	4,225	24	NW.	1	5	8	0	30	9	11	23	6	0.03	0.03	16	11	4	1	0	0	0	0	0	J.
1.0	1.8	1.5	1.4	3,830	23	NW.	2	4	8	9	34	4	16	16	0	0.00	0.00	24	7	0	0	0	0	0	0	0	A.
4.4	5.1	4.4	4.6	2,686	20	NW.	5	2	10	5	42	7	8	10	1	3.25	0.67	10	11	9	15	0	0	0	0	0	S.
4.4	3.8	4.0	4.1	2,721	20	W.	2	6	12	6	52	2	6	6	1	2.44	0.53	12	14	5	12	0	1	0	0	0	O.
6.9	8.5	7.2	7.5	2,072	20	{SW. and NE.}	1	6	2	6	58	5	7	1	4	3.90	0.80	1	12	17	23	0	11	0	0	0	N.
6.9	8.1	5.6	6.9	2,146	24	W.	2	1	5	8	62	2	6	1	6	3.07	0.82	5	13	13	18	0	17	0	0	0	D.
...	...	...	...	......	..	....	..	...	...	...	...	...	...	...	..	28.03	....	...	...	...	136	0	62	0	0	2	Y.

PORT HURON, MICH.

[H=6.33. h=53.]

Cloudiness (in tenths): 7 a. m.	3 p. m.	11 p. m.	Mean.	Wind: Total (miles).	Maximum.	Direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Precipitation: Total.	Max. 24 hours.	Number of days—Clear.	Fair.	Cloudy.	Rain or snow.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder-storms.	Auroras.	Months and year.
4.8	6.8	5.1	5.6	8,305	33	W.	2	6	1	4	35	15	19	11	0	2.87	0.69	8	13	10	15	22	29	0	0	0	J.
4.9	7.2	4.0	5.4	4,792	32	NW.	2	7	2	8	14	20	11	8	12	3.39	1.49	7	14	7	13	23	28	0	0	0	F.
5.2	4.8	4.0	4.7	6,575	35	W., SW.	9	13	3	3	11	17	18	14	5	0.71	0.20	9	17	5	14	20	30	0	0	0	M.
5.5	5.6	4.2	5.1	6,376	36	NW.	14	16	7	6	21	4	6	16	0	1.26	0.45	9	14	7	10	2	16	0	1	0	A.
3.8	5.5	3.7	4.3	6,531	32	S.	15	27	3	1	24	7	6	8	2	3.80	2.21	14	10	7	14	0	1	0	0	0	M.
2.9	4.7	3.5	3.7	6,169	30	N.	15	13	1	3	32	13	7	5	1	5.29	1.54	17	7	6	16	0	0	0	4	0	J.
3.2	4.7	4.0	4.0	5,031	23	W.	9	32	3	7	22	8	6	3	3	3.00	1.59	15	13	3	11	0	0	0	6	0	J.
5.6	7.0	3.9	5.5	5,699	27	SW.	13	20	6	6	17	9	10	11	1	3.28	1.06	5	20	6	17	0	0	0	5	0	A.
4.7	5.2	2.9	4.3	5,940	33	N.	7	18	6	5	19	17	12	5	0	2.06	1.03	11	15	4	9	0	0	0	0	0	S.
5.1	6.9	5.8	5.9	6,343	38	N.	14	12	7	5	27	12	6	10	0	2.52	0.52	10	9	12	15	0	5	0	1	0	O.
9.1	9.2	7.7	8.7	7,581	36	N.	5	7	2	3	22	17	22	10	2	3.10	0.91	0	6	24	20	0	14	0	0	0	N.
8.5	8.4	7.6	8.2	8,658	39	SW., NW	2	6	4	7	18	25	16	11	4	2.53	1.33	2	8	21	21	12	26	0	0	0	D.
5.3	6.3	4.7	5.4	77,400	..	....	107	177	45	58	262	165	139	112	30	33.81	2.21	107	146	112	175	79	149	0	17	0	Y.

PORTLAND, ME.

[H=99. h=76.]

Cloudiness (in tenths): 7 a. m.	3 p. m.	11 p. m.	Mean.	Wind: Total (miles).	Maximum.	Direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Precipitation: Total.	Max. 24 hours.	Number of days—Clear.	Fair.	Cloudy.	Rain or snow.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder-storms.	Auroras.	Months and year.
5.1	5.1	4.7	5.0	7,227	40	SE.	11	5	1	1	12	21	29	11	2	3.02	1.27	11	11	9	10	14	26	0	0	1	J.
3.6	4.4	3.9	4.0	5,785	41	E.	12	11	3	2	5	4	24	18	5	3.68	2.95	12	11	5	7	17	28	0	0	1	F.
5.6	4.7	3.9	4.7	5,949	26	W.	23	5	3	3	14	8	21	13	3	1.59	0.54	6	20	5	11	8	27	0	0	1	M.
4.2	4.2	4.5	4.3	6,296	36	NE.	12	10	6	3	16	8	14	18	3	2.09	0.64	14	10	6	9	0	3	0	1	1	A.
4.6	5.2	3.9	4.6	4,675	34	N.	9	10	5	5	26	8	9	7	14	1.91	0.61	12	13	6	11	0	0	0	0	2	M.
3.9	4.9	3.8	4.2	5,640	30	S.	6	4	3	1	28	14	17	10	7	4.06	2.61	12	13	5	7	0	0	1	3	1	J.
4.8	5.0	3.5	4.4	4,627	24	S.	13	2	4	16	20	14	19	5	0	5.63	1.61	8	17	6	13	0	0	0	5	0	J.
4.8	5.2	4.7	4.9	5,025	25	SE.	8	5	2	14	20	9	13	21	1	5.91	2.11	8	16	7	13	0	0	0	3	1	A.
2.6	3.3	3.3	3.1	5,221	25	NW.	7	2	3	7	18	16	22	13	2	1.37	0.53	17	10	3	8	0	0	0	1	1	S.
4.1	5.6	4.0	4.6	4,840	26	S.	17	7	10	7	17	7	16	11	1	4.32	1.96	12	13	6	11	0	3	0	1	2	O.
4.3	7.0	5.6	5.6	5,666	50	SE.	14	23	2	3	4	12	16	12	4	3.45	1.60	7	17	6	10	1	13	0	0	1	N.
6.0	6.2	5.4	5.9	6,555	36	W.	19	2	1	3	6	18	27	11	6	2.94	1.10	7	14	10	16	14	29	0	0	1	D.
4.5	5.1	4.3	4.6	67,506	..	....	151	86	43	65	186	139	227	150	48	39.97	2.95	126	165	74	126	54	129	1	14	13	Y.

Monthly and yearly meteorological summaries—Continued.

PORTLAND, OREG.

[Latitude, 45° 32′ N.; longitude, 122° 43′ W. Local time, 3.11 slow, Eastern.]

Months and year.	Pressure.			Temperature.								Dew point.				Relative humidity.			
	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	Mean. Maximum.	Mean. Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.
	In.	In.	In.	°	°	°	°	°	°	°	°	°	°	°	°				
J..	30.046	30.34	29.52	34.8	37.8	36.7	36.3	55	17	42.7	31.5	30.9	31.2	32.0	31.4	87	77	83	83
F..	30.014	30.40	29.68	44.4	50.0	47.2	47.2	59	31	53.2	41.5	40.7	42.2	42.0	41.6	87	75	83	82
M.	30.074	30.52	29.76	45.4	56.7	53.9	52.0	72	33	63.5	42.9	40.5	42.0	43.7	42.1	84	60	70	71
A..	29.949	30.24	29.57	44.1	59.2	55.9	55.9	82	35	68.3	41.5	39.0	39.1	40.9	39.3	83	46	59	63
M	29.878	30.14	29.64	51.2	64.5	61.1	59.0	94	40	74.5	48.9	47.1	46.8	47.4	47.1	86	55	63	68
J..	29.948	30.17	29.62	53.8	65.5	63.7	61.0	80	42	73.7	50.5	48.9	50.2	51.9	50.3	84	59	67	70
J..	29.912	30.15	29.62	58.6	73.3	72.0	68.0	99	49	83.1	57.3	53.5	52.9	55.0	53.8	84	50	56	63
A..	29.901	30.09	29.60	56.4	73.3	69.7	66.5	94	47	82.5	52.8	52.5	53.3	55.3	53.7	87	51	61	67
S..	29.880	30.15	29.62	55.8	68.4	62.8	62.2	85	41	73.8	51.1	52.1	52.9	53.6	52.9	89	59	74	[illegible]
O..	29.920	30.14	29.66	49.4	61.9	56.6	56.0	82	34	69.1	40.0	47.1	46.9	49.0	47.7	93	61	77	77
N..	29.753	30.23	29.11	44.3	50.7	46.8	47.3	65	34	57.6	40.7	42.2	43.4	43.0	42.9	98	77	88	88
D..	29.991	30.40	29.48	41.2	45.2	42.7	43.0	59	27	50.0	37.8	[illegible]	40.2	39.5	39.7	94	84	89	89
Y..	29.939	30.52	29.11	48.2	58.9	55.8	54.2	99	17	66.0	45.2	44.5	45.0	46.1	45.2	87	63	73	74

PRESCOTT, ARIZ.

[Latitude, 34° 33′ N.; longitude, 112° 28′ W. Local time, 2.30 slow, Eastern.]

Months and year.	Pressure: Mean.	Pressure: Maximum.	Pressure: Minimum.	Temp. 7 a. m.	Temp. 3 p. m.	Temp. 11 p. m.	Temp. Mean.	Temp. Maximum.	Temp. Minimum.	Temp. Mean Maximum.	Temp. Mean Minimum.	Dew point 7 a. m.	Dew point 3 p. m.	Dew point 11 p. m.	Dew point Mean.	Rel. hum. 7 a. m.	Rel. hum. 3 p. m.	Rel. hum. 11 p. m.	Rel. hum. Mean.
J..	24.747	24.98	24.46	24.1	42.5	31.9	32.8	57	−4	45.8	21.7	20.2	23.7	25.0	23.0	84	48	75	69
F..	24.705	25.00	24.41	29.4	51.9	39.8	40.2	66	14	55.6	26.3	23.1	21.5	26.2	23.6	78	32	60	57
M.	24.773	25.00	24.56	35.0	57.4	45.6	46.0	69	21	60.7	32.5	29.3	28.2	32.8	30.1	80	36	63	60
A..	24.666	24.91	24.40	41.0	61.8	51.9	51.6	80	28	65.3	38.9	33.7	33.8	35.2	34.2	76	37	54	56
M.	24.668	24.81	24.49	45.6	72.0	59.6	59.0	90	33	75.2	44.4	36.1	39.8	40.3	38.7	70	33	50	51
J..	24.747	24.93	24.49	49.1	77.3	64.0	63.5	89	38	80.6	47.3	34.4	36.6	38.0	36.3	56	24	40	41
J..	24.814	24.92	24.69	60.7	84.7	74.3	73.2	98	48	88.4	60.0	47.9	49.4	49.8	49.0	64	31	43	47
A..	24.806	24.91	24.70	61.2	81.2	70.1	70.8	97	50	85.4	59.8	52.9	52.9	54.8	53.4	75	49	59	58
S..	24.762	24.80	24.57	51.2	79.6	63.9	64.9	90	30	82.0	49.3	37.5	41.3	40.3	39.7	60	27	43	44
O..	27.774	24.92	24.59	40.7	71.2	52.8	54.9	84	30	74.1	38.8	31.5	32.1	33.7	32.4	71	26	50	49
N..	24.745	24.95	24.30	34.0	55.6	42.4	44.3	75	21	59.4	31.6	31.6	33.5	35.1	34.4	89	48	77	71
D..	24.782	25.07	24.40	30.1	50.4	36.0	38.8	65	10	53.6	26.1	24.9	29.0	29.5	27.8	82	47	78	69
Y..	24.749	25.07	24.30	41.9	65.5	52.6	53.3	98	−4	68.9	39.6	33.6	35.1	36.7	35.1	74	36	56	56

RED BLUFF, CAL.

[Latitude, 40° 10′; longitude, 122° 15′ W. Local time 3.09 slow, Eastern.]

RIO GRANDE CITY, TEX.

[Latitude, 26° 23′ N.; longitude, 98° 48′ W. Local time, 1.35 slow, Eastern.]

Months and year.	Pressure: Mean.	Pressure: Maximum.	Pressure: Minimum.	Temp. 7 a. m.	Temp. 3 p. m.	Temp. 11 p. m.	Temp. Mean.	Temp. Maximum.	Temp. Minimum.	Temp. Mean Maximum.	Temp. Mean Minimum.	Dew point 7 a. m.	Dew point 3 p. m.	Dew point 11 p. m.	Dew point Mean.	Rel. hum. 7 a. m.	Rel. hum. 3 p. m.	Rel. hum. 11 p. m.	Rel. hum. Mean.
J..	29.981	30.64	29.66	44.7	58.1	50.7	51.2	80	24	60.0	43.2	39.2	42.9	42.8	41.6	82	68	76	74
F..	29.858	30.17	29.49	49.2	63.5	55.4	56.0	87	33	65.4	48.0	43.6	42.7	45.6	44.0	83	55	72	70
M.	29.909	30.20	29.02	61.5	73.2	62.8	66.8	92	40	75.7	60.0	56.6	58.2	57.6	57.5	84	62	73	74
A..	29.723	29.96	29.44	70.8	88.1	74.9	77.9	96	56	89.4	69.4	67.1	62.1	66.4	65.2	89	45	76	70
M.	29.690	29.89	29.47	72.6	86.8	76.4	78.6	98	62	88.0	71.0	70.0	69.7	70.5	70.1	92	59	83	78
J..	29.769	29.88	29.58	78.0	96.2	82.9	85.7	104	70	97.6	77.3	72.4	68.2	71.0	70.5	83	40	68	64
J..	29.789	29.95	29.60	77.1	96.9	82.3	85.4	104	72	98.5	76.2	72.7	65.6	70.5	69.7	86	37	68	64
A..	29.753	29.88	29.64	76.6	96.5	82.4	85.2	109	72	99.3	76.3	72.6	66.1	71.0	69.9	87	38	69	65
S..	29.729	29.83	29.60	75.2	90.4	79.3	81.6	100	68	92.0	74.9	72.8	71.6	72.6	72.3	[illegible]	57	81	77
O..	29.835	30.00	29.58	64.8	80.9	70.7	72.1	92	52	82.2	64.6	59.6	60.6	62.3	60.8	84	53	75	70
N..	29.848	30.18	29.38	58.6	77.9	65.7	67.4	93	36	79.1	57.6	52.2	57.3	54.3	54.6	79	52	69	67
D..	29.947	30.36	29.29	53.5	71.9	60.4	61.9	88	32	73.1	52.2	46.6	49.3	49.2	48.4	78	47	68	65
Y..	29.810	30.54	29.29	65.2	81.7	70.6	72.5	109	24	83.4	64.2	60.4	59.5	61.2	60.4	85	50	73	70

Monthly and yearly meteorological summaries—Continued.

PORTLAND, OREG.
[*H*=80. *h*=75.]

Cloudiness (in tenths). 7 a. m.	3 p. m.	11 p. m.	Mean.	Wind. Total (miles).	Maximum.	Direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Precipitation. Total.	Max. 24 hours.	Number of days— Clear.	Fair.	Cloudy.	Rain or snow.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder-storms.	Auroras.	Month and year.
																In.	In.										
7.7	7.4	6.6	7.2	2,218	15	S.	11	0	16	0	18	2	14	0	32	4.57	1.28	4	10	17	19	1	17	0	0	0	J
8.1	9.2	8.7	8.7	2,177	18	W.	8	1	0	1	29	10	7	7	21	6.72	1.37	1	4	23	23	0	1	0	0	0	F
3.8	4.0	2.5	3.4	2,425	18	E., NE.	7	5	4	0	14	2	12	17	32	0.63	0.30	10	9	6	7	0	0	0	0	0	M
2.5	3.8	2.7	3.0	2,390	18	NW.	8	1	3	1	11	0	6	28	32	1.12	0.85	19	8	3	6	0	0	0	0	0	A
5.8	6.2	6.0	6.0	2,701	15	SW.	10	1	2	1	19	7	7	22	24	4.60	1.06	8	10	13	13	0	0	1	0	0	M
6.8	6.8	6.3	6.6	2,295	16	W.	18	1	0	0	21	3	8	14	25	1.77	0.57	5	11	14	11	0	0	0	0	0	J
5.0	5.0	3.0	4.3	2,550	16	SW.	16	0	0	0	10	5	3	28	30	0.24	0.24	11	13	6	1	0	0	6	1	0	J
2.5	1.9	0.6	1.7	2,955	14	NW.	8	0	0	8	8	0	1	50	28	0.00	0.00	23	6	2	0	0	0	2	0	0	A
3.9	4.9	3.5	4.1	3,597	21	S., SW.	2	0	0	13	21	5	0	33	15	2.48	0.93	11	12	6	9	0	0	0	0	0	S
3.5	4.3	3.1	3.6	2,871	20	S.	3	1	2	16	8	3	2	43	16	1.68	0.64	16	8	7	9	0	0	0	0	0	O
6.6	8.1	6.6	7.1	3,761	30	S.	0	2	2	16	39	4	1	10	14	8.52	3.10	3	11	16	23	0	0	0	0	0	N
5.5	7.5	6.0	6.3	2,939	23	S.	8	4	5	16	31	0	3	13	14	7.17	2.26	7	12	12	10	0	4	0	0	0	D
5.1	5.8	4.6	5.2	32,894	..	....	94	16	34	74	224	41	64	263	283	39.59	3.10	124	114	125	140	1	22	9	1	0	Y

PRESCOTT, ARIZ.
[*H*=5,389. *h*=8.]

7 a. m.	3 p. m.	11 p. m.	Mean.	Total (miles).	Maximum.	Direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Total.	Max. 24 hours.	Clear.	Fair.	Cloudy.	Rain or snow.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder-storms.	Auroras.	Month and year.
1.5	3.1	2.2	2.3	2,605	24	S.	26	3	4	2	11	6	1	3	38	0.08	0.07	21	8	2	2	2	28	0	0	0	J
1.3	3.4	0.9	1.9	3,730	42	S.	6	1	1	2	20	8	3	15	28	0.46	0.32	20	6	2	3	0	24	0	1	0	F
2.4	5.5	3.0	3.7	3,679	30	S.	9	7	5	3	27	4	4	3	31	1.47	0.70	14	11	6	6	0	14	0	5	0	M
2.8	3.6	1.7	2.7	6,735	35	S.	2	1	3	3	51	5	1	4	15	0.02	0.34	15	15	0	4	0	3	0	2	0	A
1.4	3.7	1.0	2.0	5,169	29	S.	3	0	0	2	46	8	0	2	32	0.37	0.29	20	11	0	4	0	0	1	4	0	M
2.8	3.1	2.0	2.6	6,366	32	S.	0	0	2	5	50	7	0	0	26	0.07	0.05	17	10	3	2	0	0	0	2	0	J
3.0	4.8	2.3	3.4	5,015	29	S.	1	1	1	2	48	10	1	1	28	2.63	2.25	16	12	3	8	0	0	13	9	0	J
3.8	5.2	3.3	4.1	4,012	35	E.	5	2	5	3	38	5	2	3	30	1.24	0.44	11	19	1	11	0	0	7	16	0	A
0.6	1.5	0.8	1.0	4,478	36	S.	3	3	2	2	39	11	4	0	26	0.11	0.11	27	3	0	1	0	0	0	3	0	S
1.0	1.9	0.4	1.1	2,779	29	S.	8	0	6	3	23	11	2	2	39	0.38	0.30	28	2	1	3	0	1	0	2	0	O
2.2	3.7	2.4	2.8	3,962	33	S.	11	1	2	4	28	9	5	5	25	2.46	1.60	20	8	2	7	0	17	0	1	0	N
2.4	2.9	2.3	2.5	2,763	27	SW., NW	7	16	8	2	1	24	4	2	32	0.32	0.20	20	8	3	5	0	26	0	0	0	D
2.1	3.5	1.9	2.6	51,293	..	....	80	37	53	38	382	108	27	40	350	10.11	2.25	229	113	23	66	2	113	21	45	0	Y

RED BLUFF, CAL.
[*H*=337. *h*=39.]

[illegible]

RIO GRANDE CITY, TEX.
[*H*=230. *h*=2.]

7 a. m.	3 p. m.	11 p. m.	Mean.	Total (miles).	Maximum.	Direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Total.	Max. 24 hours.	Clear.	Fair.	Cloudy.	Rain or snow.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder-storms.	Auroras.	Month and year.
5.2	5.1	4.9	5.1	3,897	24	NW.	19	6	5	14	6	2	6	29	6	2.36	1.49	10	9	12	8	0	4	0	0	0	J
5.1	5.7	4.8	5.2	3,827	23	NW.	24	8	5	17	6	1	6	14	4	1.12	0.62	9	9	10	6	0	0	0	0	0	F
7.3	7.3	5.9	6.8	4,464	20	NW., SE.	13	10	21	26	7	0	8	5	6	0.41	0.12	3	10	18	6	0	0	2	0	0	M
5.7	5.2	3.4	4.8	6,068	23	SE.	7	5	24	44	6	1	0	1	2	2.60	1.06	7	17	6	4	0	0	14	4	0	A
6.3	6.8	5.1	5.9	5,067	32	E.	8	13	15	45	4	1	0	2	5	10.28	4.37	6	16	9	13	0	0	13	0	0	M
2.3	4.2	1.6	2.7	7,040	21	SE.	0	0	8	80	2	0	0	0	0	0.00	0.00	17	12	1	0	0	0	30	0	0	J
1.9	3.5	1.4	2.3	6,368	20	SE.	1	2	9	76	2	1	0	0	2	1.28	0.53	23	6	2	6	0	0	30	7	0	J
1.9	4.9	3.0	2.9	5,896	21	SE.	6	7	13	54	0	0	0	2	5	0.97	0.57	17	13	1	6	0	0	31	7	0	A
4.5	5.2	2.9	4.2	4,434	19	SE.	14	6	5	34	6	2	1	11	11	5.24	1.94	12	14	4	8	0	0	18	7	0	S
5.0	4.6	3.7	4.4	3,616	22	NW.	21	10	8	24	4	0	2	15	9	1.85	1.06	11	13	7	6	0	0	2	0	0	O
4.0	3.3	2.9	3.4	3,460	24	NW.	19	4	0	25	5	0	2	11	15	0.12	0.12	14	12	4	1	0	0	1	0	0	N
2.5	2.0	2.7	3.1	4,282	31	SW.	20	2	12	29	4	2	3	10	11	0.39	0.27	10	13	2	5	0	0	0	0	0	D
4.4	4.9	3.4	4.2	58,350	..	....	152	73	134	468	58	10	22	100	78	26.52	4.37	145	144	76	69	0	4	141	34	0	Y

Monthly and yearly meteorological summaries—Continued.

ROCHESTER, N. Y.

[Latitude, 43° 8′ N.; longitude, 77° 42′ W. Local time, 0.11, slow, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a. m.	Temperature. 3 p. m.	Temperature. 11 p. m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew point. 7 a. m.	Dew point. 3 p. m.	Dew point. 11 p. m.	Dew point. Mean.	Relative humidity. 7 a. m.	Relative humidity. 3 p. m.	Relative humidity. 11 p. m.	Relative humidity. Mean.
	In.	*In.*	°	°	°	°	°	°	°	°	°	°	°	°	°				
J..	29.346	29.97	28.51	18.1	23.1	18.8	20.0	57	−6	26.9	12.6	14.9	18.1	14.9	14.6	81	72	80	78
F..	29.279	29.78	28.48	10.2	17.2	12.0	13.7	46	−11	22.0	6.1	8.6	11.2	8.2	[illegible]	82	76	79	80
M..	29.391	29.73	28.75	17.1	23.1	18.7	20.0	52	−7	28.1	12.0	12.4	16.4	15.4	14.7	82	75	82	80
A..	29.257	29.88	28.60	38.2	46.4	39.5	41.4	90	20	52.5	32.1	32.1	[illegible]	32.0	31.0	79	65	76	74
M..	29.278	29.53	28.94	51.1	60.5	54.5	55.4	85	31	66.9	46.9	45.0	48.0	47.0	47.3	82	67	74	76
J..	29.310	29.61	28.89	58.2	69.2	61.0	63.1	90	41	76.6	52.7	53.2	57.3	55.3	55.3	86	67	80	77
J..	29.290	29.64	29.02	65.8	75.4	66.0	69.0	95	40	81.7	60.7	60.5	64.2	62.4	62.5	86	69	83	79
A..	29.307	29.34	28.84	60.3	68.7	62.3	63.8	87	44	73.0	56.0	57.0	59.1	58.0	58.0	88	72	88	8[illegible]
S..	29.378	29.80	28.84	54.0	65.1	57.0	58.0	82	[illegible]	71.2	50.0	50.0	54.8	52.8	52.5	87	71	84	81
O..	29.324	29.85	28.84	[illegible]	52.6	44.5	47.8	73	20	56.4	41.7	41.0	43.7	43.1	42.5	81	73	88	[illegible]
N..	29.344	29.67	28.88	34.3	42.2	40.0	40.5	72	24	48.8	34.0	34.2	36.5	36.2	35.6	86	76	86	82
D..	29.303	30.03	28.45	27.6	31.1	28.2	29.3	58	4	33.3	22.1	22.5	26.6	25.5	25.2	85	83	88	85
Y..	29.312	30.03	28.45	40.2	48.0	43.7	42.7	93	−11	54.2	34.0	35.0	38.2	37.0	37.0	85	73	83	80

ROSEBURG, OREG.

[Latitude, 43° 13′ N.; longitude, 123° 20′ W. Local time, 3.12, slow, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a. m.	Temperature. 3 p. m.	Temperature. 11 p. m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew point. 7 a. m.	Dew point. 3 p. m.	Dew point. 11 p. m.	Dew point. Mean.	Relative humidity. 7 a. m.	Relative humidity. 3 p. m.	Relative humidity. 11 p. m.	Relative humidity. Mean.
J..	29.872	29.96	29.10	40.1	46.6	44.4	43.4	[illegible]	27	51.9	37.6	[illegible]	38.1	40.2	39.2	[illegible]	79	[illegible]	[illegible]
F..	29.604	29.95	[illegible]	44.5	50.5	49.0	48.0	67	29	55.6	42.3	42.0	41.7	43.6	42.4	91	74	[illegible]	[illegible]
M..	29.509	30.03	[illegible]	42.2	55.6	54.5	50.8	73	29	63.7	38.0	40.0	42.4	44.3	42.2	92	62	70	75
A..	29.478	29.80	29.10	42.7	59.7	56.6	53.0	82	31	66.0	40.6	40.5	41.8	41.8	41.3	92	52	[illegible]	[illegible]
M..	29.439	29.08	29.31	48.6	64.9	61.2	58.3	[illegible]	30	71.6	47.2	46.1	46.7	46.6	46.5	91	53	61	[illegible]
J..	29.437	29.68	29.23	50.9	65.3	61.3	59.2	85	30	71.1	48.8	47.3	47.0	48.3	47.7	90	52	64	[illegible]
J..	29.434	29.69	29.22	55.1	75.3	71.6	67.3	101	46	83.0	52.0	51.2	50.6	51.4	51.1	87	43	51	[illegible]
A..	29.437	29.61	29.29	53.7	72.5	70.6	65.6	92	46	82.2	51.6	49.7	50.6	52.7	51.1	87	46	54	[illegible]
S..	29.440	29.65	29.13	51.1	70.3	65.2	62.2	90	34	78.0	49.0	48.3	48.1	51.4	49.8	90	46	62	67
O..	29.482	29.72	29.20	46.9	64.0	58.1	56.3	91	29	72.6	44.0	44.8	47.4	48.7	47.0	[illegible]	57	72	74
N..	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	...	...	...	...
D..	29.682	29.67	29.01	[illegible]	47.1	44.5	44.7	61	22	51.3	38.6	41.4	[illegible]	42.4	42.2	90	[illegible]	[illegible]	91
Y..	......	......	......	......	......	......	......	101	27	......	......	......	......	......	......	...	...	...	...

SACRAMENTO, CAL.

[Latitude, 38° 35′ N.; longitude, 121° 30′ W. Local time, 3.06, slow, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a. m.	Temperature. 3 p. m.	Temperature. 11 p. m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew point. 7 a. m.	Dew point. 3 p. m.	Dew point. 11 p. m.	Dew point. Mean.	Relative humidity. 7 a. m.	Relative humidity. 3 p. m.	Relative humidity. 11 p. m.	Relative humidity. Mean.
J..	30.114	30.30	29.60	44.5	48.4	48.6	47.1	62	34	52.7	[illegible]	42.8	42.9	44.7	42.7	92	83	87	[illegible]
F..	30.063	30.30	29.79	48.0	57.1	55.2	54.3	70	40	62.6	46.4	44.6	45.6	46.1	45.2	83	67	71	74
M..	30.015	30.32	29.75	52.5	64.1	60.6	60.1	77	46	70.5	50.2	45.2	45.6	48.2	46.4	77	53	65	66
A..	29.906	30.13	29.47	53.9	66.3	61.6	60.6	83	39	71.3	51.6	48.9	51.1	51.4	50.5	84	59	70	71
M..	29.839	29.99	29.64	56.5	73.3	66.7	65.7	94	49	79.4	54.6	47.5	48.9	50.9	48.5	74	44	[illegible]	[illegible]
J..	29.890	30.37	29.66	57.1	74.6	66.9	66.2	91	51	79.9	53.9	49.6	50.5	51.1	50.4	76	44	67	[illegible]
J..	29.817	30.05	29.65	61.1	79.6	72.1	71.0	98	56	86.2	59.7	51.4	54.1	52.3	52.9	71	42	58	[illegible]
A..	29.782	29.93	29.59	61.0	82.3	73.9	72.0	105	51	91.0	59.3	50.6	54.5	54.6	53.3	[illegible]	[illegible]	[illegible]	[illegible]
S..	29.809	29.97	29.60	58.0	80.2	71.3	69.6	[illegible]	50	86.2	56.3	48.7	49.5	49.9	49.4	72	38	46	52
O..	29.897	30.06	29.62	54.1	72.6	65.1	64.3	96	43	73.9	51.4	47.9	42.3	50.1	49.1	81	48	61	[illegible]
N..	29.925	30.22	29.41	50.9	58.0	54.5	54.4	77	38	61.6	48.2	47.7	48.7	50.3	49.2	90	76	[illegible]	84
D..	30.004	30.30	29.72	47.1	50.5	48.6	49.1	63	32	53.8	45.0	45.3	46.4	46.8	46.2	94	87	[illegible]	[illegible]
Y..	29.9[illegible]	30.3[illegible]	29.41	53.9	67.5	62.2	61.2	105	34	72.2	51.6	47.5	48.2	48.8	48.6	[illegible]	[illegible]	67	[illegible]

SAINT LOUIS, MO.

[Latitude, 38° 38′ N.; longitude, 90° 12′ W. Local time, 1.01, slow, Eastern.]

Monthly and yearly meteorological summaries—Continued.

ROCHESTER, N. Y.

[H = 621. h = 145.]

Cloudiness (in tenths).				Wind.													Precipitation.		Number of days—									
7 a.m.	3 p.m.	11 p.m.	Mean.	Total (miles.)	Maximum.	Direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Total.	Max. 24 hours.	Clear.	Fair.	Cloudy.	Rain or snow.	Max. below 32°.	Min. below [illegible]	Max. above 32°.	Thunder-storms.	Auroras.	Months and years.
																In.	In.										
8.0	8.0	6.5	7.5	11,492	60	SW.	0	8	3	8	9	27	22	13	1	2.12	0.71	1	14	16	21	18	28	0	0	0	J.
7.0	8.0	6.0	7.0	9,157	45	W.	2	8	1	17	4	18	33	9	2	1.54	0.52	3	12	13	11	20	26	0	0	1	F.
7.3	6.5	6.7	7.6	9,914	52	SW.	2	7	1	4	8	19	30	20	2	0.96	0.18	1	15	15	21	18	29	0	0	1	M.
5.7	6.5	5.3	5.8	8,596	38	W.	6	9	8	5	6	18	15	20	3	2.06	1.48	9	10	11	11	1	16	0	0	0	A.
6.2	7.5	2.8	5.6	6,937	34	S.	5	11	8	14	11	16	15	6	8	2.02	0.55	6	15	10	13	0	1	0	2	0	M.
4.8	6.1	3.9	4.9	7,306	34	W.	5	2	1	2	6	26	28	14	4	4.27	1.67	0	12	9	8	0	0	0	4	1	J.
5.8	5.4	4.8	5.3	6,825	32	SW.	8	10	2	7	6	26	16	13	6	2.74	1.29	6	17	8	10	0	0	3	5	0	J.
7.2	7.2	5.5	6.6	5,893	37	SE.	9	9	5	11	7	17	13	14	8	2.20	0.65	4	12	15	17	0	0	0	4	0	A.
5.2	4.9	2.9	4.3	6,755	28	{SW. W., NW}	7	11	5	6	10	23	14	10	4	2.40	0.84	9	15	6	10	0	0	0	1	0	S.
6.3	7.8	6.0	6.5	6,039	32	N.	5	12	10	8	9	21	13	9	6	2.66	0.72	7	10	14	16	0	2	0	0	0	O.
9.0	8.8	7.2	8.3	7,140	40	S.	9	8	2	8	13	21	20	6	4	2.10	0.51	0	10	20	16	0	14	0	0	0	N.
8.7	8.9	8.0	8.6	9,406	36	W.	8	3	7	8	8	23	28	13	0	2.25	0.73	0	10	21	18	7	27	0	0	0	D.
6.8	7.3	5.6	6.6	94,499	...	......	61	86	53	96	96	251	254	146	48	26.31	1.69	55	152	158	171	64	147	3	16	2	Y.

ROSEBURG, OREG.

[H = 523. h = 46.]

6.9	7.5	7.6	7.0	1,137	.	......	5	9	7	4	6	5	4	4	47	2.99	1.07	3	12	16	16	0	5	0	0	0	J.
7.8	8.1	7.5	7.8	1,823	14	SE., SW.	4	6	7	4	19	10	8	8	28	5.28	1.09	2	8	18	21	0	8	0	0	0	F.
3.1	4.9	2.5	3.5	1,219	13	SW.	9	7	2	0	4	5	7	13	46	0.28	0.16	12	16	3	4	0	1	0	0	0	M.
3.9	4.3	2.6	3.6	1,895	20	SW.	24	6	4	0	8	4	6	12	32	1.21	0.62	18	13	4	7	0	1	0	1	0	A.
5.0	5.9	5.6	5.5	2,160	16	SW.	20	13	3	0	7	9	7	12	22	2.91	0.70	11	8	12	12	0	0	0	0	0	M.
6.4	6.7	6.7	6.6	2,273	15	N.	23	8	6	2	2	9	10	18	12	1.53	0.69	3	13	14	7	0	0	0	1	0	J.
2.8	2.6	2.4	2.7	2,504	24	NE.	28	12	2	1	0	1	9	19	20	0.07	0.07	18	12	1	1	0	0	6	2	0	J.
0.9	0.8	0.9	0.8	1,822	15	NW.	23	3	1	0	2	0	10	13	41	.—	.—	20	4	1	0	0	0	2	0	0	A.
3.5	3.4	2.5	3.1	1,510	10	SW.	6	2	2	1	1	7	14	16	41	0.36	0.14	16	11	3	6	0	0	0	0	0	S.
3.0	4.3	3.4	3.6	865	12	NW.	3	4	3	1	2	2	15	3	60	2.66	0.80	14	12	5	6	0	0	1	0	0	O.
...	...	...	...	......	...	......	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	N.
5.8	7.4	6.9	6.7	715	12	E.	2	4	5	4	7	9	8	5	45	6.62	1.56	4	11	14	19	0	0	0	0	0	D.
...	...	...	...	......	...	......	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	Y.

SACRAMENTO, CAL.

[H = 64. h = 57.]

SAINT LOUIS, MO.

[H = 571. h = 90].

Monthly and yearly meteorological summaries—Continued.

SAINT MICHAEL'S, ALASKA.

[Latitude, 63° 29' N.; longitude, 161° 48' W. Local time, 5.39 slow, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a. m.	Temperature. 3 p. m.	Temperature. 11 p. m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew point. 7 a. m.	Dew point. 3 p. m.	Dew point. 11 p. m.	Dew point. Mean.	Relative humidity. 7 a. m.	Relative humidity. 3 p. m.	Relative humidity. 11 p. m.	Relative humidity. Mean.
	In.	In.	In.	°	°	°	°	°	°	°	°	°	°	°	°				
J ..	29.743	30.34	29.19	11.9	11.8	12.7	12.1	40	−31	19.0	5.6	8.7	8.7	9.6	9.0	[illegible]	87	[illegible]	[illegible]
F ..	29.697	30.72	29.33	−16.1	−16.4	−15.7	−16.1	11	−56	−4.2	−28.1	−21.0	−20.8	−20.8	−20.7	78	[illegible]	78	78
M ..	29.904	30.56	29.14	8.8	8.9	12.0	9.2	42	−26	16.4	1.2	2.9	4.8	7.3	4.8	89	81	91	[illegible]
A ..	29.679	30.60	28.89	23.7	25.6	26.8	25.4	41	4	31.6	18.9	20.4	20.7	22.3	21.1	87	81	[illegible]	[illegible]
M ..	29.901	30.19	29.20	32.8	36.9	32.8	34.2	56	10	43.8	20.0	30.5	31.4	32.2	31.4	91	81	78	[illegible]
J ..	29.855	30.21	29.40	44.9	47.8	48.5	47.3	63	31	53.2	42.1	41.1	41.9	42.7	41.9	[illegible]	80	79	[illegible]
J ..	29.902	30.21	29.31	49.7	53.1	55.6	52.8	[illegible]	40	58.4	47.1	47.2	48.0	48.2	47.8	91	[illegible]	77	84
A ..	29.771	30.25	29.50	48.6	51.5	53.0	51.0	65	37	56.2	45.0	43.3	46.3	44.5	43.7	[illegible]	[illegible]	79	[illegible]
S ..	29.610	29.88	29.28	42.6	44.2	44.7	44.2	[illegible]	27	47.8	40.2	39.3	38.7	39.1	39.1	[illegible]	[illegible]	81	[illegible]
O ..	29.487	30.00	28.90	32.8	32.8	33.3	33.0	46	20	36.5	28.6	29.8	30.4	29.9	29.7	[illegible]	87	87	[illegible]
N ..	29.616	30.20	28.67	7.7	8.2	8.2	8.0	31	−21	14.3	1.8	6.0	6.6	5.9	5.8	91	[illegible]	90	[illegible]
D ..	29.729	30.40	[illegible]	1.8	2.3	2.8	2.3	35	−43	11.2	−7.5	−1.2	−1.0	−0.6	−0.9	87	[illegible]	[illegible]	[illegible]
Y ..	29.740	30.72	28.67	24.0	25.6	26.8	25.5	66	−53	31.7	18.0	20.7	21.1	21.6	21.2	87	[illegible]	[illegible]	[illegible]

SAINT PAUL, MINN.

[Latitude, 44° 58' N.; longitude, 93° 3' W. Local time, 1.13 slow, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a. m.	Temperature. 3 p. m.	Temperature. 11 p. m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew point. 7 a. m.	Dew point. 3 p. m.	Dew point. 11 p. m.	Dew point. Mean.	Relative humidity. 7 a. m.	Relative humidity. 3 p. m.	Relative humidity. 11 p. m.	Relative humidity. Mean.
J ..	29.176	29.71	28.54	−4.9	9.3	5.3	4.6	47	−36	13.9	−5.1	−4.2	2.2	0.1	−1.3	79	74	79	77
F ..	29.035	29.56	28.51	2.8	15.3	10.5	9.8	49	−24	24.6	1.0	−5.8	4.0	1.7	0.3	87	[illegible]	[illegible]	87
M ..	29.126	29.52	28.50	20.6	32.6	27.9	27.0	55	−6	36.5	18.3	13.8	21.6	18.9	18.1	79	66	76	76
A ..	29.070	29.40	28.62	39.5	50.6	45.8	45.3	75	20	57.8	37.5	34.4	40.5	38.1	38.0	82	70	78	77
M ..	29.010	29.30	28.64	49.7	63.8	56.6	56.7	87	27	69.8	46.9	44.4	48.7	48.8	47.2	[illegible]	60	74	72
J ..	28.962	29.41	28.64	60.2	74.4	66.0	66.9	89	[illegible]	79.4	57.2	57.8	62.8	61.4	60.6	91	[illegible]	[illegible]	81
J ..	29.030	29.31	28.66	66.6	79.2	71.6	72.5	[illegible]	55	84.1	62.7	63.8	68.0	66.9	66.5	91	71	[illegible]	82
A ..	29.058	29.48	28.74	59.0	72.3	63.6	65.0	84	46	75.3	57.0	55.2	59.2	58.0	57.5	[illegible]	64	[illegible]	78
S ..	29.073	29.36	28.46	50.7	62.3	56.2	56.1	[illegible]	38	71.0	49.3	47.5	51.1	51.1	49.9	[illegible]	67	79	78
O ..	29.062	29.41	28.79	36.7	51.1	41.7	43.2	79	23	53.5	34.7	34.2	41.0	37.0	37.4	89	71	84	[illegible]
N ..	29.004	29.42	28.47	30.0	37.7	32.2	32.3	62	17	39.7	27.0	27.0	30.4	29.3	29.1	91	70	[illegible]	[illegible]
D ..	29.121	29.65	28.42	17.8	25.1	20.4	21.1	53	−18	28.8	13.2	12.6	17.7	16.8	16.0	84	74	[illegible]	81
Y ..	[illegible]	29.71	28.42	36.1	48.3	41.7	42.0	93	−36	52.8	32.6	31.7	37.4	36.7	34.9	84	[illegible]	[illegible]	77

SAINT VINCENT, MINN.

[Latitude, 48° 58' N.; longitude, 97° 14' W. Local time, 1.29 slow, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a. m.	Temperature. 3 p. m.	Temperature. 11 p. m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew point. 7 a. m.	Dew point. 3 p. m.	Dew point. 11 p. m.	Dew point. Mean.	Relative humidity. 7 a. m.	Relative humidity. 3 p. m.	Relative humidity. 11 p. m.	Relative humidity. Mean.
J ..	29.183	29.82	28.43	−16.0	−2.8	−10.2	−9.9	30	−46	3.5	−22.0	−18.1	−9.9	−12.0	−12.7	[illegible]	71	[illegible]	[illegible]
F ..	29.152	29.80	28.55	−11.5	2.4	−3.4	−4.2	38	−39	6.1	−15.6	−12.8	−4.7	−4.6	−6.6	[illegible]	[illegible]	[illegible]	[illegible]
M ..	29.220	29.71	28.42	10.0	20.7	14.7	15.1	42	−25	23.9	2.8	7.1	12.0	10.8	9.9	87	[illegible]	[illegible]	78
A ..	29.107	29.53	28.42	29.9	43.7	36.6	36.7	65	−14	47.2	27.0	26.7	31.8	31.9	30.2	87	65	[illegible]	78
M ..	29.005	29.43	28.72	42.7	56.8	49.6	50.6	85	22	62.5	40.4	39.9	44.1	44.2	42.7	87	[illegible]	82	78
J ..	29.112	29.46	28.54	52.2	66.8	57.4	58.8	84	32	71.0	47.9	48.9	56.8	53.3	53.5	92	71	[illegible]	84
J ..	29.022	29.30	28.47	57.5	71.0	61.8	63.4	91	39	74.4	54.2	55.9	62.1	58.2	58.6	94	77	91	87
A ..	29.111	29.50	28.76	49.5	65.8	54.3	56.3	86	27	71.4	47.1	47.8	57.3	53.6	53.0	[illegible]	[illegible]	[illegible]	[illegible]
S ..	29.083	29.50	28.47	43.2	65.4	50.7	53.1	82	24	68.0	40.2	40.5	51.9	46.2	46.2	[illegible]	[illegible]	[illegible]	79
O ..	29.119	29.39	28.66	33.6	48.9	37.6	40.0	70	17	51.2	29.2	30.8	38.5	32.4	33.6	[illegible]	[illegible]	81	78
N ..	29.137	29.50	28.72	24.6	32.1	26.2	27.6	40	1	33.1	20.3	22.0	24.9	22.8	22.2	[illegible]	74	[illegible]	[illegible]
D ..	29.110	[illegible]	[illegible]	7.6	14.3	10.8	11.6	39	−21	21.7	−0.2	6.3	8.8	7.9	7.4	91	72	87	[illegible]
Y ..	29.115	[illegible]	28.42	27.6	41.0	32.8	33.4	91	−46	44.6	22.5	24.4	31.1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

SALT LAKE CITY, UTAH.

[Latitude, 40° 46' N.; longitude, 111° 54' W. Local time, 2.27 slow, Eastern.]

Monthly and yearly meteorological summaries—Continued.

SAINT MICHAEL'S, ALASKA.

[H=30. h=2.]

Cloudiness (in tenths).				Wind.												Precipitation.		Number of days—									Months and year.
7 a. m.	3 p. m.	11 p. m.	Mean.	Total (miles).	Maximum.	Direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Total.	Max. 24 hours.	Clear.	Fair.	Cloudy.	Rain or snow.	Max. below 32°.	Min. [illegible] 32°.	Max. above 90°.	Thunder storms.	Auroras.	
																In.	In.										
4.4	3.1	4.5	4.7	12,745	60	E.	18	22	33	3	5	5	2	0	4	0.88	0.11	11	13	7	7	28	31	0	0	2	J.
2.0	3.4	3.5	3.8	6,621	36	S.	23	5	4	1	14	14	1	6	16	0.31	0.06	16	8	4	8	28	28	0	0	2	F.
4.9	5.5	4.9	5.1	7,221	48	S.	22	10	18	5	9	1	0	0	33	1.07	0.25	11	8	12	9	15	27	0	0	3	M.
8.4	7.8	8.3	8.2	12,299	50	S.	20	9	20	9	13	8	1	0	1	0.77	0.14	1	7	22	16	12	28	0	0	1	A.
6.8	8.5	7.8	7.7	7,538	46	SE.	12	16	13	7	11	10	6	10	9	1.04	0.28	3	9	19	13	2	18	0	0	1	M.
8.6	8.6	8.4	8.5	7,741	38	SE.	10	9	15	10	11	11	15	3	6	3.51	0.80	1	7	22	19	0	1	0	0	0	J.
7.6	8.8	8.5	8.3	8,645	44	S.	12	11	10	5	26	19	5	3	2	3.06	0.59	2	5	24	21	0	0	0	0	0	J.
8.0	8.2	8.3	8.2	10,273	44	S.	8	3	18	6	28	11	11	4	4	4.50	1.21	1	9	21	22	0	0	0	0	0	A.
7.8	8.2	7.9	8.0	10,118	36	S., N.	43	5	16	3	0	3	2	7	2	3.39	1.09	3	5	22	19	0	5	0	0	4	S.
6.1	7.2	7.0	6.8	11,825	64	E.	29	12	29	6	10	0	2	1	1	1.62	0.94	3	15	13	12	4	26	0	0	1	O.
5.5	6.5	6.4	6.1	9,715	56	SE.	26	9	20	6	9	4	6	7	3	0.47	0.12	7	10	13	12	30	30	0	0	2	N.
5.6	5.5	5.3	5.4	6,484	56	E.	6	11	26	5	12	19	2	1	11	0.75	0.15	10	9	12	14	27	31	0	0	6	D.
6.4	6.9	6.7	6.7	114,425	..	......	235	122	217	66	157	111	53	42	92	20.93	1.21	69	105	191	172	146	220	0	0	22	Y.

SAINT PAUL, MINN.

[H=831. h=106.]

SAINT VINCENT, MINN.

[H=804. h=14.]

SALT LAKE CITY, UTAH.

[H=4,348. h=76.]

7 a. m.	3 p. m.	11 p. m.	Mean.	Total (miles).	Maximum.	Direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Total.	Max. 24 hours.	Clear.	Fair.	Cloudy.	Rain or snow.	Max. below 32°.	Min. [illegible] 32°.	Max. above 90°.	Thunder storms.	Auroras.	Months and year.
5.2	6.7	4.2	5.4	2,410	15	SE.	4	2	4	21	6	2	9	17	28	1.48	0.45	8	13	10	10	13	27	0	0	0	J.
7.5	7.3	6.0	6.9	2,378	24	S.	4	3	16	10	12	3	4	14	18	1.66	0.36	4	10	14	15	1	19	0	0	0	F.
2.2	2.6	1.7	2.1	2,770	22	NW.	19	8	7	10	6	5	9	18	11	0.64	0.49	20	10	1	2	0	6	0	0	0	M.
6.2	5.9	4.2	5.4	3,006	26	SW.	6	6	6	10	9	3	7	12	28	3.47	1.01	7	14	7	15	0	0	0	1	0	A.
4.1	4.5	4.5	4.4	2,852	28	SE.	11	8	8	2	3	4	5	21	31	2.49	1.02	10	17	4	12	0	0	0	4	0	M.
4.4	5.6	4.0	4.7	3,853	27	E.	18	4	8	20	11	1	8	11	14	2.07	2.00	19	17	4	6	0	0	1	3	0	J.
4.0	4.0	2.8	3.6	4,366	22	S.	23	11	9	19	13	1	4	13	0	0.56	0.58	12	18	1	1	0	0	11	2	0	J.
4.5	3.9	3.3	3.9	3,921	37	NW.	16	14	8	24	15	5	3	8	0	0.90	0.30	13	13	5	6	0	0	13	12	0	A.
3.8	4.0	2.4	3.4	3,584	22	SE.	13	14	5	26	7	1	6	14	4	1.29	0.63	15	9	6	4	0	0	0	3	0	S.
3.0	4.3	2.4	3.2	2,823	22	NW.	12	9	12	15	8	0	15	16	6	0.59	0.51	13	13	8	3	0	2	0	3	0	O.
5.4	6.8	3.0	5.4	3,705	26	NW.	9	2	12	40	8	4	5	9	1	3.10	0.96	7	14	9	13	0	12	0	0	0	N.
5.1	6.2	3.0	5.1	2,809	27	SE.	6	7	11	24	6	6	0	22	3	0.92	0.32	9	11	11	10	6	24	0	0	0	D.
4.6	5.2	3.6	4.5	38,276	..	.....	141	88	106	221	103	33	79	175	144	10.69	2.00	129	159	73	99	19	90	25	28	0	Y.

Monthly and yearly meteorological summaries—Continued.

SAN ANTONIO, TEX.

[Latitude, 29° 27′ N.; longitude, 98° 30′ W. Local time, 1.34 slow, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a. m.	Temperature. 3 p. m.	Temperature. 11 p. m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew point. 7 a. m.	Dew point. 3 p. m.	Dew point. 11 p. m.	Dew point. Mean.	Relative humidity. 7 a. m.	Relative humidity. 3 p. m.	Relative humidity. 11 p. m.	Relative humidity. Mean.
	In.	*In.*	*In.*	°	°	°	°	°	°	°	°	°	°	°	°				
J..	......	......	......	...	......	......	......	...	...	......	......	......	......	......	......	...	...	...	...
F..	......	......	......	...	......	......	......	...	...	......	......	......	......	......	......	...	...	...	...
M..	29.[illegible]	29.[illegible]	29.03	52.2	65.3	59.1	58.7	[illegible]	[illegible]	68.6	46.6	46.3	50.6	50.5	48.6	84	62	74	73
A..	29.135	29.42	28.[illegible]	62.9	78.1	68.4	68.9	[illegible]	53	79.6	60.5	58.1	56.5	61.1	60.2	[illegible]	[illegible]	73	73
M..	29.092	29.26	28.81	66.1	78.7	72.4	70.7	[illegible]	51	80.2	61.7	62.3	62.0	62.5	62.9	91	64	80	78
J..	29.166	29.28	28.[illegible]	72.8	87.0	78.0	78.9	[illegible]	[illegible]	91.4	71.1	70.0	67.0	69.4	[illegible]	94	[illegible]	72	72
J..	29.166	29.[illegible]	29.06	72.9	88.0	78.7	78.4	[illegible]	65	88.8	71.2	71.1	68.0	69.0	70.0	94	57	[illegible]	78
A..	29.155	29.27	29.04	72.9	90.9	80.9	81.5	[illegible]	66	94.2	72.2	74.1	65.7	67.0	67.8	[illegible]	44	[illegible]	67
S..	29.147	29.28	29.[illegible]	70.7	84.0	75.5	77.0	[illegible]	[illegible]	86.7	69.3	68.1	66.0	67.7	67.6	[illegible]	57	72	73
O..	29.220	29.52	28.97	57.2	74.0	64.0	64.4	[illegible]	41	79.1	54.0	52.0	52.0	53.2	52.0	[illegible]	44	[illegible]	[illegible]
N..	29.227	29.52	28.72	52.1	71.2	58.0	60.7	87	34	74.0	46.2	43.4	43.0	44.4	44.9	70	46	[illegible]	[illegible]
D..	29.[illegible]	29.65	28.[illegible]	47.0	63.4	53.6	54.0	81	[illegible]	62.3	42.7	42.0	44.2	44.2	43.7	84	63	72	76
Y..	......	......	......	......	......	......	......	[illegible]	...	......	......	......	......	......	......	...	...	...	...

SAN DIEGO, CAL.

[Latitude, 32° 43′ N.; longitude, 117° 10′ W. Local time, 2.48 slow, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a. m.	Temperature. 3 p. m.	Temperature. 11 p. m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew point. 7 a. m.	Dew point. 3 p. m.	Dew point. 11 p. m.	Dew point. Mean.	Relative humidity. 7 a. m.	Relative humidity. 3 p. m.	Relative humidity. 11 p. m.	Relative humidity. Mean.
J..	30.022	30.2[illegible]	29.76	46.2	61.8	[illegible]	54.6	68	[illegible]	62.6	45.4	42.6	48.4	47.1	46.1	[illegible]	[illegible]	[illegible]	76
F..	29.976	30.22	29.70	46.3	62.6	54.1	56.4	70	[illegible]	64.1	45.0	44.3	51.1	46.6	46.0	[illegible]	67	[illegible]	72
M..	29.[illegible]	30.16	29.[illegible]	54.0	66.5	58.3	58.6	81	42	68.0	51.4	47.4	51.7	50.6	50.0	[illegible]	61	72	73
A..	29.922	30.16	29.71	54.7	66.5	61.1	62.9	[illegible]	47	68.7	53.2	51.0	54.9	54.6	53.7	84	[illegible]	78	76
M..	29.855	29.98	29.74	58.0	64.9	62.1	63.3	73	52	70.0	58.2	54.3	56.9	56.3	55.8	84	[illegible]	[illegible]	77
J..	29.914	30.05	29.80	60.6	70.2	62.2	64.2	74	52	70.9	58.2	54.0	54.8	56.2	55.7	84	[illegible]	78	76
J..	29.886	30.02	29.75	63.3	73.1	66.4	67.6	82	[illegible]	74.6	62.6	58.7	58.6	58.8	58.3	[illegible]	[illegible]	78	76
A..	29.923	29.94	29.[illegible]	67.5	77.1	70.8	71.8	[illegible]	62	78.6	66.6	62.6	64.1	62.9	62.5	84	[illegible]	[illegible]	76
S..	29.809	29.93	29.67	63.6	73.8	68.5	68.0	[illegible]	[illegible]	78.1	61.7	60.0	62.4	61.9	61.4	[illegible]	[illegible]	[illegible]	81
O..	29.[illegible]	30.01	29.74	58.4	68.6	62.5	63.9	[illegible]	47	71.2	57.0	57.5	58.4	59.6	58.3	84	70	[illegible]	85
N..	29.927	30.11	29.72	54.5	66.4	58.0	59.6	76	41	67.6	52.0	51.8	54.1	54.2	52.3	[illegible]	[illegible]	[illegible]	82
D..	29.[illegible]	30.18	29.79	51.8	66.2	54.8	57.1	79	40	[illegible]	44.6	48.0	48.1	49.4	47.8	[illegible]	57	[illegible]	73
Y..	29.918	30.2[illegible]	29.67	57.2	[illegible]	62.6	62.2	[illegible]	[illegible]	68.6	58.2	52.6	56.6	55.1	54.4	[illegible]	64	[illegible]	77

SANDUSKY, OHIO.

[Latitude, 41° 29′ N.; longitude, 82° 40′ W. Local time, 0.29 slow, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a. m.	Temperature. 3 p. m.	Temperature. 11 p. m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew point. 7 a. m.	Dew point. 3 p. m.	Dew point. 11 p. m.	Dew point. Mean.	Relative humidity. 7 a. m.	Relative humidity. 3 p. m.	Relative humidity. 11 p. m.	Relative humidity. Mean.
J..	29.[illegible]	30.[illegible]	29.02	18.9	25.9	21.8	22.0	51	−9	28.7	12.6	12.8	16.1	14.0	14.4	73	[illegible]	73	72
F..	29.[illegible]	30.[illegible]	28.58	13.7	22.9	18.4	18.1	48	−15	27.3	8.0	7.3	12.3	11.0	10.7	73	[illegible]	73	72
M..	29.974	29.72	28.[illegible]	22.6	30.4	27.0	27.0	54	−3	34.6	18.3	17.0	19.7	19.3	18.7	75	[illegible]	73	71
A..	29.853	30.00	28.78	41.0	48.0	44.2	44.0	84	24	54.0	37.7	34.2	36.5	36.2	35.3	78	[illegible]	74	71
M..	29.250	29.[illegible]	28.[illegible]	53.3	60.8	56.9	56.7	85	36	63.4	49.0	48.2	45.0	45.6	45.3	78	[illegible]	71	[illegible]
J..	29.852	30.01	28.[illegible]	63.7	72.6	64.6	67.0	[illegible]	46	75.2	57.8	54.8	55.1	54.9	54.9	74	[illegible]	72	[illegible]
J..	29.802	29.58	29.04	70.6	80.0	72.8	74.8	92	53	[illegible]	66.4	61.9	62.9	62.3	62.7	78	67	73	[illegible]
A..	29.804	29.81	28.81	64.7	71.6	65.6	67.8	91	49	75.6	60.6	57.6	59.3	56.5	58.4	78	[illegible]	77	74
S..	29.978	30.04	28.67	68.1	60.6	62.4	62.4	84	48	72.3	55.0	50.6	52.1	53.0	51.9	77	[illegible]	72	[illegible]
O..	29.306	29.[illegible]	28.82	46.1	54.9	49.6	50.8	79	32	60.1	43.6	40.8	42.4	42.8	41.9	[illegible]	[illegible]	78	74
N..	29.279	29.72	28.80	36.7	42.8	41.0	41.2	70	25	46.8	36.5	32.7	34.2	33.6	33.5	79	70	[illegible]	72
D..	29.946	30.06	28.56	29.6	34.7	31.0	31.6	[illegible]	zero.	36.4	24.0	22.3	23.1	23.[illegible]	24.6	78	71	78	73
Y..	29.350	30.[illegible]	28.56	42.6	51.2	46.2	47.0	[illegible]	−15	55.2	38.3	36.6	38.5	38.1	37.7	77	64	74	71

SANDY HOOK, N. J.

[Latitude, 40° 27′ N.; longitude, 74° 0′ W. Local time, 0.04 fast, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a. m.	Temperature. 3 p. m.	Temperature. 11 p. m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew point. 7 a. m.	Dew point. 3 p. m.	Dew point. 11 p. m.	Dew point. Mean.	Relative humidity. 7 a. m.	Relative humidity. 3 p. m.	Relative humidity. 11 p. m.	Relative humidity. Mean.
J..	30.000	30.[illegible]	29.[illegible]	29.6	33.0	[illegible]	31.0	[illegible]	7	1					.8	77	[illegible]	[illegible]	[illegible]
F..	29.962	30.40	29.07	28.6	37.8	34.6	33.2	[illegible]	1	1					.2	77	71	[illegible]	72
M..	30.022	30.40	29.55	28.8	35.0	29.8	30.5	57	7	1					.8	74	64	72	[illegible]
A..	30.011	30.56	29.47	42.5	54.5	44.6	47.2	[illegible]	23	5					[illegible]	77	56	78	[illegible]
M..	29.930	30.20	29.58	51.7	58.4	52.8	54.6	[illegible]	41	6					[illegible]	[illegible]	67	81	77
J..	29.951	30.23	29.41	63.1	74.4	63.6	67.1	90	[illegible]	7					.3	[illegible]	56	72	[illegible]
J..	29.951	30.20	29.[illegible]	70.1	80.2	70.9	73.7	97	[illegible]	[illegible]					.5	[illegible]	64	[illegible]	77
A..	29.961	30.25	29.67	68.7	78.8	69.9	71.8	90	[illegible]	7					.1	[illegible]	68	84	78
S..	30.046	30.38	29.[illegible]	60.9	70.4	62.8	64.7	85	46	7					.1	[illegible]	73	77	[illegible]
O..	29.997	30.22	29.10	52.6	58.2	54.0	55.2	75	[illegible]	[illegible]					[illegible]	81	76	[illegible]	[illegible]
N..	30.015	30.34	29.55	42.7	48.7	45.3	46.2	72	[illegible]	[illegible]					[illegible]	[illegible]	71	81	78
D..	29.[illegible]	30.70	29.10	34.7	39.8	36.9	37.0	60	16	[illegible]					[illegible]	[illegible]	70	77	76
Y..	30.001	30.[illegible]	29.07	47.3	36.0	48.8	50.4	97	1	[illegible]					[illegible]	81	[illegible]	76	76

Monthly and yearly meteorological summaries—Continued.

SAN ANTONIO, TEX.

[H=781. h=2.]

Cloudiness (in tenths).				Wind.												Precipitation.		Number of days—									
7 a. m.	3 p. m.	11 p. m.	Mean.	Total (miles).	Maximum.	Direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Total.	Max. 24 hours.	Clear.	Fair.	Cloudy.	Rain or snow.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder-storms.	Auroras.	Months and year.
																In.	In.										
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	J.
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	F.
5.4	7.3	5.4	6.0	4,870	30	N.	18	21	15	5	13	6	1	1	0	3.37	1.60	5	12	8	8	0	0	0	2	0	M.
6.9	7.3	5.3	6.5	7,052	32	S.	17	13	20	22	8	5	1	1	3	5.12	1.68	4	12	14	12	0	0	0	9	0	A.
6.2	6.2	5.2	5.9	6,532	40	S.	10	29	12	36	8	3	0	5	0	7.92	2.12	5	14	12	11	0	0	0	9	0	M.
5.2	4.8	1.3	3.8	5,678	30	SE.	1	3	6	60	15	0	0	0	5	0.36	0.58	8	21	1	3	0	0	21	0	0	J.
5.7	5.1	2.5	4.4	2,805	20	[illegible]	2	2	[illegible]	[illegible]	20	1	1	1	11	6.50	3.26	9	16	6	7	0	0	18	1	0	J.
3.0	4.6	1.9	3.2	8,605	18	SE.	7	11	5	45	12	1	0	2	10	0.95	0.75	17	13	1	4	0	0	29	1	0	A.
5.1	5.9	3.0	4.7	3,861	16	SE.	30	18	9	23	6	0	1	1	2	1.61	0.88	11	14	5	10	0	0	12	3	0	S.
3.9	4.8	3.1	3.8	4,718	22	S.	31	10	5	12	15	4	1	5	1	0.65	0.37	15	10	6	4	0	0	0	1	0	O.
3.8	5.4	3.4	4.2	5,204	26	N.	26	14	6	19	11	4	5	6	0	0.70	0.62	11	11	8	1	0	0	0	0	0	N.
3.9	4.9	2.9	4.2	6,173	39	N.	24	4	10	23	14	10	[illegible]	5	0	1.75	1.60	14	8	9	4	0	4	0	1	0	D.
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	Y.

SAN DIEGO, CAL.

[H=67. h=80.]

SANDUSKY, OHIO.

[H=630. h=66.]

SANDY HOOK, N. J.

[H=28. h=1.]

Monthly and yearly meteorological summaries—Continued.

SANFORD, FLA.

[Latitude, 28° 48′ N.; longitude, 81° 23′ W. Local time, 0.25 slow, Eastern.]

Months and year.	Pressure.			Temperature.						Mean.		Dew point.				Relative humidity.			
	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.
	In.	*In.*	*In.*	°	°	°	°	°	°	°	°	°	°	°	°				
J ..	30.155	30.44	[illegible]	58.4	68.1	[illegible]	62.2	84	41	71.2	55.1	54.3	54.4	55.3	54.7	87	64	83	78
F ..	30.045	30.32	29.63	53.2	68.3	56.0	58.5	81	33	69.4	49.3	47.9	46.8	50.2	48.3	89	52	81	72
M .	30.106	30.42	29.82	55.8	71.2	58.6	61.9	88	43	73.4	53.1	50.9	50.4	52.1	51.1	84	50	79	71
A ..	30.056	30.32	29.80	66.1	80.2	66.7	71.0	91	52	83.1	62.2	60.4	57.3	60.9	59.5	83	47	81	70
M .	29.963	30.14	29.74	71.2	80.1	70.4	73.9	92	61	85.4	66.8	66.7	63.0	65.7	65.1	83	59	86	77
J ..	30.050	30.20	29.87	77.0	83.1	75.2	78.4	96	68	89.7	72.3	74.1	72.3	73.6	73.1	91	72	94	86
J ..	30.053	30.22	29.84	78.2	85.0	75.4	79.5	95	70	91.7	72.5	74.2	71.6	72.7	72.8	88	66	92	82
A ..	29.998	30.13	29.80	77.0	85.1	76.5	79.7	95	70	91.6	73.4	75.1	71.8	73.5	73.5	[illegible]	66	91	83
S ..	29.965	30.10	29.76	75.8	84.4	75.7	78.5	94	68	89.4	72.6	74.2	72.7	73.9	73.6	97	70	94	87
O ..	29.950	30.14	29.51	66.3	77.2	67.8	70.4	90	48	79.5	64.3	63.4	61.7	63.2	62.8	90	60	80	79
N ..	30.039	30.26	29.73	56.7	71.6	59.9	62.7	86	35	73.1	53.9	52.2	53.0	54.9	53.4	86	53	84	74
D ..	30.160	30.50	29.89	50.1	63.4	53.4	55.6	85	32	66.0	46.6	45.0	47.6	46.7	46.4	83	68	80	74
Y ..	30.045	30.50	29.51	65.5	76.3	66.3	69.4	96	32	80.3	61.8	61.5	60.2	61.8	61.2	87	60	86	78

SAN FRANCISCO, CAL.

[Latitude, 37° 48′ N.; longitude, 122° 26′ W. Local time, 3.10 slow, Eastern.]

J ..	30.108	30.39	29.79	48.8	51.7	51.3	50.6	61	43	55.0	47.2	46.1	45.3	47.1	46.2	91	80	86	85
F ..	30.087	30.38	29.84	51.8	57.0	54.5	54.4	69	46	60.3	50.3	48.2	46.2	48.4	47.6	89	69	81	80
M .	30.043	30.30	29.81	53.6	60.8	55.8	56.0	76	49	63.3	52.1	48.9	47.5	48.9	48.4	84	65	79	76
A ..	29.937	30.15	29.56	54.3	61.1	55.8	57.1	75	47	63.2	53.1	49.9	48.9	49.6	49.5	85	66	80	77
M .	29.902	30.04	29.76	53.8	62.0	55.9	57.2	77	50	63.5	52.7	50.0	50.5	49.9	50.1	87	67	81	78
J ..	29.959	30.12	29.77	53.7	60.7	56.4	56.9	67	49	62.7	53.0	50.9	51.0	51.2	51.0	90	71	83	81
J ..	29.919	30.13	29.70	57.1	65.0	59.3	60.5	78	54	67.0	56.1	54.3	55.1	54.4	54.6	91	71	84	82
A ..	29.900	29.96	29.70	55.7	62.7	57.0	58.5	81	52	64.7	54.6	52.8	53.5	52.8	53.0	90	73	86	83
S ..	29.861	29.96	29.75	56.4	66.4	59.2	60.7	86	52	68.5	53.1	53.6	53.7	54.1	53.8	91	66	84	80
O ..	29.972	30.13	29.70	56.4	63.4	58.7	59.5	76	53	66.2	55.2	54.4	55.3	54.1	54.6	93	76	85	85
N ..	29.924	30.23	29.38	55.4	69.5	57.1	57.8	70	50	61.8	53.9	52.2	52.1	52.5	52.3	89	77	85	84
D ..	30.084	30.27	29.66	51.2	56.0	53.3	53.5	67	44	59.4	48.5	46.4	48.0	48.1	47.5	85	75	83	81
Y ..	29.966	30.39	29.36	54.0	60.5	56.2	56.9	87	43	[illegible]	52.6	50.8	50.6	50.9	50.7	89	71	83	81

SAN LUIS OBISPO, CAL.

[Latitude, 35° 18′ N.; longitude, 120° 39′ W. Local time, 3.06 slow, Eastern.]

SANTA FÉ, N. MEX.

[Latitude, 35° 41′ N.; longitude, 105° 57′ W. Local time, 2.04 slow, Eastern.]

J ..	23.232	23.47	22.90	17.2	32.6	22.2	24.0	48	−8	30.6	18.3	8.8	17.3	12.2	12.8	69	53	65	62
F ..	23.105	23.52	22.80	25.7	39.6	31.0	32.2	56	8	43.3	22.9	16.5	16.9	16.3	16.9	64	42	60	55
M	23.200	23.48	23.02	32.6	47.9	40.1	40.2	62	22	51.6	30.5	24.0	20.0	24.5	23.1	70	38	55	54
A ..	23.212	23.43	22.80	30.2	53.4	44.7	45.6	70	23	57.2	36.2	28.6	31.4	30.5	30.2	06	46	59	57
M .	23.236	23.42	23.00	44.1	60.5	52.9	52.5	77	35	64.1	42.5	32.6	32.6	34.3	33.1	66	40	53	53
J ..	23.348	23.52	23.11	52.6	70.5	61.6	61.6	83	40	74.5	51.5	33.8	26.6	31.0	31.3	49	23	39	37
J ..	23.410	23.62	23.31	58.6	77.4	67.6	67.9	88	51	81.1	57.7	45.9	44.2	48.3	46.1	63	32	51	49
A ..	23.411	23.55	23.25	58.2	74.9	65.8	66.3	88	49	78.7	56.4	46.4	47.6	48.5	47.5	64	40	55	54
S ..	23.361	23.53	23.09	51.1	69.2	58.9	59.7	81	40	72.5	48.5	37.7	38.9	40.4	39.0	60	35	52	49
O ..	23.341	23.49	23.15	40.8	60.0	48.1	49.6	74	27	63.1	37.6	29.2	31.1	31.5	30.6	64	36	54	51
N ..	23.273	23.52	22.87	34.3	47.4	38.4	40.0	62	20	50.7	30.4	22.6	24.3	23.6	23.5	63	42	56	54
D ..	23.277	23.64	22.74	27.0	39.8	30.6	32.4	57	−1	43.2	22.4	19.1	21.6	21.0	20.6	72	62	68	64
Y ..	23.297	23.64	22.74	40.1	56.1	46.6	47.7	88	−3	59.7	37.5	28.6	29.4	30.6	29.5	64	40	56	52

Monthly and yearly meteorological summaries—Continued.

SANFORD, FLA.

[*H*=25. *h*=35.]

Cloudiness (in tenths). 7 a.m.	3 p.m.	11 p.m.	Mean.	Wind. Total (miles).	Maximum.	Direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Precipitation. Total.	Max. 24 hours.	Number of days— Clear.	Fair.	Cloudy.	Rain or snow.	Max. below 32°.	Min. below [illegible]	Max. above [illegible]	Thunder-storms.	Auroras.	Months and year.
																In.	*In.*										
6.9	6.4	5.5	6.3	5,449	22	NE., N., NE.	22	22	4	7	10	10	7	7	4	3.00	0.82	6	10	13	15	0	0	0	0	0	J.
5.6	5.0	2.9	4.5	4,638	24	SW., NW	20	13	2	6	9	8	9	17	0	3.96	1.29	8	12	8	11	0	0	0	1	0	F.
5.2	4.4	2.5	4.4	4,496	22	NW., N.	29	14	5	6	7	8	17	6	2	4.60	2.21	14	8	9	10	0	0	0	2	0	M.
1.8	4.1	2.4	2.8	4,262	27	NE.	13	22	14	11	8	4	10	6	7	1.52	1.25	17	12	1	4	0	0	2	2	0	A.
4.5	5.3	4.0	4.6	3,921	27	N.	11	16	9	18	8	12	7	5	7	4.93	1.35	9	17	5	18	0	0	6	9	0	M.
3.7	6.7	3.6	4.7	2,783	26	NE.	11	12	11	10	20	13	4	2	7	5.89	1.13	10	16	4	17	0	0	11	11	0	J.
2.8	6.7	2.8	3.9	2,971	22	NE., S.	2	9	13	8	16	22	11	3	9	6.52	1.20	10	20	1	16	0	0	23	7	0	J.
2.8	6.7	3.2	4.2	3,643	27	NE.	9	7	7	14	19	21	8	5	3	6.75	1.18	10	17	4	19	0	0	22	8	0	A.
3.5	6.2	4.3	4.7	2,921	20	SE.	15	22	9	14	5	5	9	4	7	10.73	2.76	8	16	6	20	0	0	15	7	0	S.
4.4	5.1	3.0	4.2	5,163	30	NE.	23	19	4	6	4	13	13	10	1	7.46	6.09	14	11	6	6	0	0	1	1	0	O.
3.5	4.6	2.7	3.6	3,625	20	N.	16	6	6	6	6	4	18	19	9	0.29	0.10	16	9	5	5	0	0	0	0	0	N.
4.9	3.8	2.9	3.9	4,739	33	N.	27	10	5	1	9	4	13	19	5	1.85	0.90	12	13	6	7	0	0	0	1	0	D.
4.1	5.4	3.5	4.3	48,613	..	....	196	172	89	107	116	124	126	102	61	56.68	6.09	134	161	70	145	0	0	80	49	0	Y.

SAN FRANCISCO, CAL.

[*H*=60. *h*=68.]

SAN LUIS OBISPO, CAL.

[*H*=270. *h*=80.]

...	...	...	...	......	..	....	...	...	...	...	...	...	...	...	...	......	......	...	...	...	...	...	...	...	...	...	J.
...	...	...	...	......	..	....	...	...	...	...	...	...	...	...	...	......	......	...	...	...	...	...	...	...	...	...	F.
...	...	...	...	......	..	....	...	...	...	...	...	...	...	...	...	......	......	...	...	...	...	...	...	...	...	...	M.
...	...	...	...	......	..	....	...	...	...	...	...	...	...	...	...	......	......	...	...	...	...	...	...	...	...	...	A.
...	...	...	...	......	..	....	...	...	...	...	...	...	...	...	...	......	......	...	...	...	...	...	...	...	...	...	M.
3.0	1.7	5.7	3.5	6,150	26	NW.	9	1	0	1	3	9	56	6	6	0.06	0.02	10	16	4	2	0	0	0	0	0	J.
3.6	3.0	4.3	3.6	5,319	24	W.	5	1	0	5	13	9	40	15	5	0.02	0.01	16	11	4	0	0	0	2	0	0	J.
3.5	0.5	1.3	[illegible]	3,746	20	W., NW.	12	1	1	5	12	4	33	20	5	.—	.—	19	12	0	0	0	0	4	0	0	A.
2.3	1.1	1.1	1.5	4,242	28	N.	15	4	1	6	7	3	28	16	10	0.02	0.01	20	10	0	0	0	0	4	0	0	S.
2.1	2.1	2.7	2.6	4,432	32	NE.	19	5	2	7	3	6	28	15	8	0.07	0.04	18	9	4	2	0	0	1	0	0	O.
4.9	5.6	3.9	4.8	5,511	44	SE.	18	6	3	14	11	4	20	7	7	12.90	8.86	13	6	11	17	0	0	0	0	0	N.
2.7	3.5	2.2	2.8	5,204	36	NE.	38	7	0	5	6	8	13	9	7	3.68	1.48	10	7	5	6	0	0	0	0	0	D.
..	...	...	...	......	..	....	...	...	...	...	...	...	...	...	...	......	......	...	...	...	...	...	...	...	...	...	Y.

SANTA FÉ, N. MEX.

[*H*=7.026. *h*=29.]

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Monthly and yearly meteorological summaries—Continued.

SAVANNAH, GA.

[Latitude, 32° 5′ N.; longitude, 81° 5′ W. Local time, 0.24 slow, Eastern.]

Months and years.	Pressure.			Temperature.						Mean.		Dew point.				Relative humidity.			
	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.
	In.	In.	In.	°	°	°	°	°	°	°	°	°	°	°	°				
J..	30.107	30.50	29.77	46.9	56.7	50.9	51.5	75	29	59.5	43.7	40.2	40.6	41.9	40.9	78	59	73	70
F..	29.960	30.35	29.30	43.7	55.0	49.5	49.5	71	22	58.5	41.5	35.8	35.8	40.7	37.4	73	51	72	65
M.	30.028	30.46	29.70	48.4	61.1	53.5	54.3	77	33	62.6	45.3	39.9	39.2	44.0	41.0	73	47	71	64
A..	30.000	30.38	29.62	60.5	73.0	64.1	65.9	87	42	74.3	57.4	53.7	51.4	53.9	53.0	79	49	71	66
M.	29.882	30.09	29.61	69.2	79.3	71.4	73.3	91	54	80.8	66.0	60.5	60.1	62.4	61.0	75	55	74	68
J..	29.978	30.16	29.77	77.0	85.7	76.4	79.7	95	64	86.7	72.4	70.9	69.2	71.2	70.4	82	59	84	75
J..	29.958	30.15	29.72	79.6	88.5	79.5	82.5	95	65	90.1	75.4	72.0	72.2	72.4	72.2	78	59	79	73
A..	29.912	30.10	29.56	77.9	86.3	79.0	81.1	94	69	87.8	74.8	73.1	71.3	73.6	72.7	85	62	84	77
S..	29.940	30.12	29.67	72.9	80.2	75.0	76.0	90	62	81.4	71.0	69.6	69.4	70.5	69.8	89	71	86	82
O..	29.905	30.17	29.38	59.8	70.5	63.1	64.5	82	47	71.3	57.7	55.0	54.8	56.9	55.6	84	60	81	75
N..	29.964	30.27	29.58	51.7	65.3	56.8	57.9	79	35	66.3	49.7	45.5	47.7	49.1	47.4	79	55	76	70
D..	30.079	30.50	29.53	45.0	58.1	50.2	51.1	72	30	61.2	41.6	38.7	39.1	41.3	39.7	79	52	73	68
Y..	29.976	30.50	29.30	61.0	71.6	64.2	65.6	95	22	73.4	58.0	54.6	54.2	56.5	55.1	80	57	77	71

SHAW, FORT, MONT.

[Latitude, 47° 31′ N.; longitude, 111° 48′ W. Local time, 2.27 slow, Eastern.]

J..	26.286	26.81	25.86	11.5	21.7	18.7	17.3	50	−28	27.3	7.3	7.3	14.0	13.2	11.5	83	72	79	78
F..	26.269	26.66	25.71	10.5	28.4	23.4	23.8	54	−16	34.0	13.7	12.1	22.7	17.0	17.8	73	79	76	76
M.	26.413	26.65	26.18	32.8	49.4	38.5	40.2	68	9	53.8	27.9	22.7	40.2	29.4	30.8	66	71	70	69
A..	26.305	26.63	25.87	39.0	52.6	43.3	45.0	76	17	58.2	32.2	22.5	31.6	26.5	26.9	54	49	54	52
M.	26.287	26.58	25.97	46.4	62.0	50.0	53.0	85	22	67.7	39.2	32.3	44.7	34.9	37.3	59	55	57	57
J..	26.317	26.61	25.87	53.6	66.9	58.8	59.8	89	32	72.9	47.2	39.9	51.7	47.6	46.4	62	61	70	64
J..	26.354	26.57	26.12	56.1	73.2	62.9	64.1	94	44	77.8	50.9	45.5	59.0	49.8	51.4	70	64	65	66
A..	26.304	26.64	26.12	52.4	72.0	60.3	61.6	96	39	76.5	48.3	40.8	55.2	44.4	46.8	67	58	59	62
S..	26.310	26.57	25.87	48.2	66.8	53.1	56.0	90	33	71.4	42.9	37.4	45.3	36.1	39.6	67	49	55	57
O..	26.373	26.75	26.00	37.9	59.5	45.6	47.7	80	17	63.5	33.4	26.8	35.9	30.9	31.2	64	43	58	55
N..	26.216	26.55	25.84	34.1	50.8	40.6	41.8	...	9	.....	30.9	25.3	30.8	28.4	28.2	71	48	62	60
D..	26.298	26.78	25.93	31.6	42.2	34.6	36.1	63	− 6	45.2	27.6	.....	.....	.....	.....	...	...	...	...
Y..	26.319	26.81	25.71	38.6	53.8	44.2	45.5	96	−28	.....	33.5	.....	.....	.....	.....	...	...	...	...

SHREVEPORT, LA.

[Latitude, 32° 30′ N.; longitude, 93° 40′ W. Local time, 1.14 slow, Eastern.]

J.	29.959	30.50	29.39	36.7	46.4	41.3	41.5	73	13	50.0	33.8	31.7	34.0	32.6	32.8	82	64	72	73
F..	29.840	30.24	29.36	38.5	51.2	45.4	45.0	78	15	56.3	35.4	31.5	32.8	34.0	32.8	77	63	66	65
M.	29.917	30.31	29.55	47.7	61.8	53.8	54.4	81	31	66.1	45.2	42.7	44.4	43.8	43.6	83	55	70	69
A..	29.770	30.13	29.49	60.4	76.1	67.4	68.0	92	49	79.7	58.6	53.8	54.5	55.9	54.7	80	51	70	67
M.	29.714	29.93	29.38	63.6	79.9	70.0	71.2	92	52	83.1	62.3	57.2	56.2	60.1	57.8	81	47	71	66
J..	29.795	29.95	29.59	73.8	90.4	79.1	81.1	98	66	93.6	71.5	68.9	69.9	70.7	69.8	85	53	77	72
J..	29.797	29.96	29.62	75.8	91.8	80.6	82.7	100	69	95.5	74.3	72.3	70.8	73.5	72.2	89	51	79	73
A..	29.762	29.91	29.59	74.3	90.8	80.3	81.8	101	62	93.3	72.8	70.4	68.0	71.6	70.0	88	48	75	71
S..	29.753	29.93	29.63	69.2	82.9	73.6	75.2	95	55	85.5	68.2	66.6	66.2	68.2	67.0	91	59	84	78
O..	29.807	30.18	29.55	52.9	70.1	59.6	60.9	83	38	72.4	51.6	49.0	48.8	52.2	50.0	87	50	77	71
N..	29.829	30.14	29.33	48.6	64.9	54.4	56.0	81	32	66.8	45.4	43.8	40.8	45.0	43.2	84	46	72	67
D..	29.943	30.31	29.16	41.8	55.9	48.0	48.6	73	25	58.7	39.0	34.8	36.9	36.5	36.1	77	52	67	65
Y..	29.824	30.50	29.16	56.9	71.8	62.8	63.8	101	13	75.1	54.8	51.9	51.9	53.7	52.5	84	52	73	70

SILL, FORT, IND. T.

[Latitude; 34° 40′ N.; longitude, 98° 23′ W. Local time, 1.33 slow, Eastern.]

J..	28.926	29.38	28.27	22.8	35.4	28.7	29.0	60	1	39.2	21.2	21.2	26.2	25.6	24.3	94	70	88	84
F..	28.806	29.19	28.24	27.7	44.2	35.0	35.6	68	6	48.1	26.7	25.5	28.1	29.1	27.6	91	55	80	76
M.	28.876	29.17	28.52	40.0	57.5	47.5	48.3	80	24	60.9	38.6	35.9	36.5	39.2	37.2	86	49	74	70
A..	28.682	29.01	28.34	52.1	70.6	59.0	60.6	87	37	73.2	50.2	48.3	47.5	50.3	48.7	87	48	74	70
M.	28.681	28.96	28.33	57.9	73.9	62.3	64.7	87	42	75.7	55.4	55.1	56.7	57.5	56.4	91	58	85	78
J..	28.719	28.98	28.48	68.4	83.5	73.2	75.0	93	59	86.4	64.6	66.3	70.4	69.2	68.6	93	66	88	82
J..	28.735	28.88	28.57	72.0	92.4	78.1	80.8	100	62	94.0	68.2	68.9	69.2	70.4	69.5	90	49	78	72
A..	28.718	28.88	28.52	68.9	90.5	76.1	78.5	103	56	92.5	65.8	65.0	62.8	64.9	64.2	88	44	70	67
S..	28.734	28.95	28.44	62.4	83.0	69.6	71.7	91	52	84.3	60.7	59.9	63.7	63.6	62.4	93	53	83	76
O..	28.775	29.12	28.51	46.9	70.6	55.7	57.7	88	33	71.9	45.8	43.4	44.9	46.2	44.8	88	43	71	67
N..	28.751	29.09	28.11	40.6	64.6	50.8	52.0	84	25	66.3	40.1	35.6	31.6	35.7	34.3	84	35	59	58
D..	28.847	29.14	28.12	35.2	53.1	41.8	43.4	70	15	55.1	34.1	33.1	35.4	36.7	35.1	92	54	82	76
Y..	28.771	29.38	28.11	49.6	68.3	56.5	58.1	103	1	70.6	47.6	46.5	47.8	49.0	47.8	90	52	78	73

Monthly and yearly meteorological summaries—Continued.

SAVANNAH, GA.

[H=87. h=56.]

SHAW, FORT, MONT.

[H=3,550. h=24.

SHREVEPORT, LA.

[H=227. h=40.]

SILL, FORT, IND. T.

[H=1,200. h=6.]

Monthly and yearly meteorological summaries—Continued.

SITKA, ALASKA.

[Latitude, 57° 3′ N.; longitude, 135° 19′ W. Local time, 4.1 slow, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a.m.	Temperature. 3 p.m.	Temperature. 11 p.m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew point. 7 a.m.	Dew point. 3 p.m.	Dew point. 11 p.m.	Dew point. Mean.	Relative humidity. 7 a.m.	Relative humidity. 3 p.m.	Relative humidity. 11 p.m.	Relative humidity. Mean.
	In.	In.	In.	°	°	°	°	°	°	°	°	°	°	°	°				
J ..	29.731	30.30	28.83	35.1	36.5	36.0	35.9	49	19	40.7	30.7	29.7	31.0	30.8	30.5	80	81	81	81
F ..	29.570	30.11	28.94	35.7	38.4	37.6	37.2	49	24	41.9	32.9	30.3	32.6	31.9	31.6	81	80	80	80
M .	29.950	30.41	29.16	38.9	42.1	41.1	40.7	59	29	46.8	35.7	34.7	36.9	36.6	36.1	85	82	84	84
A ..	29.972	30.36	29.58	39.5	43.9	42.9	42.1	52	29	48.0	36.9	34.1	35.5	35.3	35.0	82	74	76	77
M .	29.823	30.11	29.42	46.5	52.0	50.7	49.7	79	37	56.9	43.3	40.7	42.5	42.1	41.8	81	72	75	76
J ..	29.915	30.12	29.57	51.3	56.2	55.5	54.3	70	39	61.1	46.8	44.9	47.0	46.8	46.2	79	72	73	75
J ..	30.023	30.37	29.72	53.5	58.2	57.2	56.3	70	47	62.3	50.8	49.2	52.0	51.0	50.7	86	80	80	82
A ..	29.969	30.23	29.66	55.5	60.0	59.4	58.8	75	44	64.7	52.5	51.4	53.3	54.1	52.9	86	79	83	83
S ..	29.563	30.02	29.09	51.0	55.3	52.2	52.8	69	38	58.5	48.0	46.8	47.6	46.5	47.0	86	76	82	81
O ..	29.658	30.25	29.08	46.1	49.8	47.8	47.9	59	33	53.2	43.0	40.6	41.5	40.6	40.9	82	74	77	78
N ..	29.266	29.78	28.62	38.3	41.5	39.8	40.2	50	29	44.8	35.5	32.6	33.5	32.6	32.9	77	74	76	76
D ..	29.609	30.27	28.72	36.0	37.6	36.7	36.8	50	20	41.7	31.0	30.5	31.3	31.0	30.9	80	78	80	79
Y ..	29.754	30.41	28.62	44.0	47.6	46.4	46.0	79	19	51.7	40.6	38.8	40.4	39.9	39.7	82	77	79	79

SMITHVILLE, N. C.

[Latitude, 33° 55′ N.; longitude, 78° 1′ W. Local time, 0.12 slow, Eastern.]

J ..	30.156	30.68	29.74	43.8	50.2	45.8	46.6	65	21	53.1	38.9	36.5	40.6	41.0	39.4	76	72	84	77
F ..	29.991	30.45	29.31	39.2	46.5	41.7	42.5	61	16	49.1	34.5	31.4	36.4	36.1	34.6	74	69	81	75
M .	30.062	30.54	29.66	41.5	50.7	45.3	45.8	65	22	53.1	37.6	35.5	40.7	39.8	38.7	79	70	82	77
A ..	30.042	30.50	29.62	55.2	64.9	57.5	59.2	76	33	66.8	51.0	49.4	54.4	53.0	52.8	81	70	85	79
M .	29.928	30.16	29.59	66.4	74.2	67.0	69.2	83	49	76.2	61.6	62.1	65.1	62.7	63.3	86	74	86	82
J ..	30.034	30.23	29.76	74.2	80.8	74.3	76.4	92	59	82.8	68.8	69.0	70.9	69.9	69.9	84	73	86	81
J ..	29.999	30.19	29.74	78.5	84.2	79.0	80.6	90	60	86.3	73.6	73.4	75.4	74.4	74.4	85	75	86	82
A ..	29.961	30.15	29.51	76.8	83.7	78.0	79.5	91	62	86.1	72.2	72.4	74.8	74.0	73.7	86	75	88	83
S ..	30.016	30.24	29.58	71.2	77.5	73.3	74.0	86	49	78.8	66.8	67.4	69.5	68.5	68.5	88	77	85	84
O ..	29.950	30.23	29.38	57.9	67.9	60.6	62.1	80	40	69.5	53.4	53.7	58.4	56.0	56.0	86	73	85	81
N ..	29.964	30.35	29.56	49.3	60.2	52.4	54.0	74	29	61.5	45.2	44.7	49.3	47.0	47.0	84	69	82	78
D ..	30.075	30.59	29.46	42.8	51.3	45.5	46.5	65	24	53.4	38.5	35.4	40.3	38.6	38.1	76	68	78	74
Y ..	30.016	30.68	29.31	58.1	66.0	60.0	61.4	92	16	68.1	53.5	52.6	56.3	55.1	54.7	82	72	84	79

SPOKANE FALLS, WASH.

[Latitude, 47° 40′ N; longitude, 117° 25′ W. Local time, 2.49 slow, Eastern.]

J ..	28.080	28.50	27.52	16.9	25.7	23.2	21.9	50	14	30.4	13.9	13.6	18.0	17.8	16.5	67	73	80	80
F ..	27.988	28.41	27.57	32.2	39.9	37.6	36.6	54	20	43.8	30.4	29.2	34.0	33.4	32.2	89	80	85	84
M .	28.121	28.36	27.84	36.0	53.0	48.1	45.7	72	26	57.6	33.5	31.1	39.7	40.5	37.1	82	62	76	74
A ..	27.951	28.19	27.53	39.7	59.3	53.3	50.8	75	28	63.1	37.5	32.1	44.0	44.2	40.1	74	58	72	68
M .	27.914	28.21	27.49	48.5	63.4	59.8	57.2	82	35	68.3	46.0	41.8	47.9	47.7	45.8	78	60	67	68
J ..	27.941	28.20	27.69	55.6	69.3	66.9	63.9	87	44	74.5	53.4	48.5	55.0	56.2	53.2	77	62	70	70
J ..	27.954	28.13	27.74	61.3	78.0	74.7	71.3	94	47	83.0	57.2	53.2	60.8	61.9	58.6	75	56	65	65
A ..	27.970	28.18	27.76	57.9	78.2	73.9	70.0	99	47	83.3	54.8	50.3	63.4	62.4	58.7	76	63	68	69
S ..	27.936	28.25	27.63	51.8	65.8	61.1	59.6	83	37	72.0	48.9	46.3	56.4	54.3	52.3	81	72	79	78
O ..	28.044	28.39	27.71	38.8	55.6	49.6	48.0	75	26	61.0	37.0	31.6	46.5	43.4	40.5	75	78	80	76
N ..	27.876	28.36	27.43	36.8	44.8	41.8	41.1	60	25	49.9	34.9	33.3	41.0	38.6	37.6	87	86	89	88
D ..	27.986	28.44	27.58	32.1	37.2	35.0	34.8	57	13	42.8	30.1	28.7	33.3	31.1	31.0	87	86	86	86
Y ..	27.980	28.50	27.43	42.8	55.8	52.1	50.1	99	14	60.6	39.8	36.6	45.0	44.3	42.0	81	69	76	75

SPRINGFIELD, ILL.

[Latitude, 39° 48′ N; longitude, 89° 39′ W. Local time, 0.58 slow, Eastern.]

J ..	29.490	30.02	28.66	16.8	24.1	20.6	20.8	54	—14	28.6	12.0	10.4	15.8	13.6	13.2	77	71	75	74
F ..	29.356	29.84	28.86	16.5	25.9	20.4	20.9	55	—11	31.2	11.7	8.0	16.4	11.2	11.9	69	67	67	68
M .	29.418	29.78	28.96	32.8	41.8	35.7	36.8	65	12	45.8	29.1	23.0	26.9	23.4	24.4	66	56	61	61
A ..	29.317	29.69	28.92	47.4	57.5	50.2	51.7	76	30	60.8	43.1	39.3	42.9	39.9	40.7	74	61	63	66
M .	29.247	29.50	28.90	55.7	67.9	60.7	61.4	82	38	70.6	52.7	46.2	48.0	49.1	47.8	71	51	66	63
J ..	29.338	29.58	28.99	65.9	77.9	69.3	71.0	88	50	80.0	62.2	57.1	60.2	59.3	58.9	74	55	71	67
J ..	29.301	29.50	29.12	72.5	85.0	76.9	78.1	96	53	87.3	69.3	64.6	65.4	66.9	65.6	76	53	72	67
A ..	29.298	29.59	28.98	65.1	78.1	69.9	71.0	92	48	79.9	62.6	58.5	60.3	60.8	59.9	79	56	72	69
S ..	29.343	29.58	28.89	59.0	71.8	63.9	64.9	82	44	73.1	56.9	52.9	53.5	56.0	54.1	80	55	76	71
O ..	29.293	29.63	28.85	46.7	59.9	52.0	52.9	75	36	62.3	45.0	39.9	43.4	43.5	42.3	77	57	73	69
N ..	29.294	29.64	28.77	41.2	50.3	45.3	45.6	70	30	55.0	38.0	33.5	36.9	35.5	35.3	74	63	69	68
D ..	29.391	29.89	28.65	32.8	39.7	34.3	35.6	58	6	44.9	28.1	25.8	27.5	26.2	26.5	75	62	72	70
Y ..	29.341	30.02	28.65	46.0	56.7	49.9	50.9	96	—14	60.0	42.6	38.3	41.4	40.4	40.0	74	59	70	68

Monthly and yearly meteorological summaries—Continued.

SITKA, ALASKA.

[H=63. h=48.]

Cloudiness (in tenths).				Wind.															Precipitation.		Number of days—									
7 a. m.	3 p. m.	11 p. m.	Mean.	Total (miles.)	Maximum.	Direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Total.	Max. 24 hours.	Clear.	Fair.	Cloudy.	Rain or snow.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder-storms.	Auroras.	Months and year.
																In.	In.										
7.4	7.2	7.1	7.2	5,482	44	SE.	0	7	18	22	1	3	5	6	36	10.42	2.90	4	9	18	21	1	18	0	0	1	J.
7.9	7.8	7.8	7.8	7,467	45	E.	0	6	22	30	1	1	4	9	11	9.90	3.05	2	9	17	20	0	13	0	0	0	F.
5.6	6.1	6.5	6.1	6,023	44	SE.	0	0	7	14	5	10	11	17	29	12.10	3.07	10	5	16	19	0	8	0	0	2	M.
7.0	7.8	7.5	7.4	6,314	31	SE.	0	6	10	27	8	15	11	8	10	13.42	3.18	4	9	17	24	0	2	0	0	1	A.
6.7	6.7	7.4	6.9	6,289	32	NW.	1	0	3	21	1	10	18	27	17	3.55	1.18	4	9	18	15	0	0	0	0	2	M.
4.9	4.6	3.8	4.4	5,957	33	SE.	1	0	0	7	2	20	27	21	12	2.36	1.07	14	6	10	8	0	0	0	0	0	J.
7.8	6.5	6.4	[illegible]	6,716	36	NW.	0	0	2	6	3	30	6	31	13	3.85	1.34	4	10	17	10	0	0	0	0	0	J.
6.2	6.6	5.5	5.9	4,196	27	NW.	0	0	1	0	2	29	19	19	14	4.00	1.10	7	11	13	17	0	0	0	0	2	A.
8.1	7.7	8.0	7.9	7,263	42	SE.	0	6	22	26	2	4	13	0	9	8.33	1.04	1	10	19	28	0	0	0	1	3	S.
8.4	8.3	7.4	8.0	9,650	60	E.	1	5	26	40	1	3	0	8	9	13.55	2.41	1	10	20	26	0	0	0	1	1	O.
7.2	8.1	7.6	7.6	9,091	62	SE.	0	7	35	40	1	2	0	0	6	9.65	1.45	3	9	18	24	0	8	0	1	2	N.
7.5	7.5	6.0	7.0	8,945	54	W.	0	1	55	12	1	8	3	3	10	11.70	1.29	4	11	16	25	1	13	0	0	1	D.
7.1	7.0	6.8	7.0	82,398	..	....	3	37	198	256	23	135	112	158	175	102.79	3.18	58	108	190	232	2	47	0	3	15	Y.

SMITHVILLE, N. C.

[H=34. h=1.]

SPOKANE FALLS, WASH.

[H=1900. h=40.]

SPRINGFIELD, ILL.

[H=644. h=61.]

3.4	5.4	4.6	4.4	6,337	26	NW.	14	5	0	8	19	10	10	21	6	2.61	0.86	13	10	8	11	16	27	0	0	0	J.
4.8	4.9	3.0	4.3	5,562	29	NW.	9	7	10	4	6	10	19	12	7	0.64	0.27	10	14	4	8	13	24	0	1	0	F.
4.2	5.6	4.6	4.8	7,493	29	W.	6	17	8	1	4	10	13	22	8	0.17	0.06	7	19	5	5	3	16	0	0	0	M.
5.8	7.0	5.1	6.0	7,577	28	N., NW.	5	8	9	11	20	5	8	10	5	6.30	1.31	5	15	10	15	0	2	0	4	0	A.
4.1	6.3	5.2	5.2	6,875	29	W.	9	9	6	12	16	8	15	17	3	2.78	1.16	6	18	7	10	0	0	0	3	0	M.
5.6	5.9	4.8	5.4	4,409	30	S.	7	6	5	11	20	10	7	6	10	4.18	1.46	5	16	9	12	0	0	0	8	0	J.
4.0	5.6	3.5	4.6	3,522	25	SW.	3	8	5	1	11	16	9	11	34	1.82	1.00	6	18	5	9	0	0	9	8	0	J.
4.5	5.1	4.0	4.5	4,557	23	N.	12	6	11	9	10	7	11	9	18	4.82	2.10	9	15	7	10	0	0	2	7	0	A.
4.0	5.2	4.1	4.4	4,024	20	SW.	2	7	8	12	16	7	8	6	20	4.47	1.62	13	10	7	9	0	0	0	2	0	S.
3.4	5.6	4.3	4.5	5,569	22	NE.	3	13	4	7	20	6	10	22	9	6.30	1.97	12	12	7	8	0	0	0	4	0	O.
5.7	6.8	4.1	5.5	6,976	27	NE.	10	3	8	8	14	8	11	21	7	1.44	0.91	9	12	9	6	0	3	0	1	0	N.
5.5	5.1	5.9	5.5	7,335	34	NW.	10	0	5	5	23	12	15	21	2	2.52	0.95	7	15	9	10	6	16	0	0	0	D.
4.6	5.7	4.4	4.9	69,737	..	....	90	83	74	89	180	117	136	191	135	38.61	2.10	104	174	87	112	38	92	11	38	0	Y.

Monthly and yearly meteorological summaries—Continued.

STANTON, FORT, N. MEX.

[Latitude, 33° 30′ N.; longitude, 105° 26′ W. Local time, 2.2 slow, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a. m.	Temperature. 3 p. m.	Temperature. 11 p. m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew point. 7 a. m.	Dew point. 3 p. m.	Dew point. 11 p. m.	Dew point. Mean.	Relative humidity. 7 a. m.	Relative humidity. 3 p. m.	Relative humidity. 11 p. m.	Relative humidity. Mean.
	In.	In.	In.	°	°	°	°	°	°	°	°	°	°	°	°				
J	......	......	......	......	......	......	......	46	−3	36.8	13.6	......	......	......	......	...	...	...	...
F	......	......	......	......	......	......	......	67	9	55.4	26.2	......	......	......	......	...	...	...	...
M	......	......	......	......	......	......	......	76	19	60.9	31.3	......	......	......	......	...	...	...	...
A	......	......	......	......	......	......	......	78	28	67.4	37.3	......	......	......	......	...	...	...	...
M	......	......	......	......	......	......	......	84	32	71.2	41.6	......	......	......	......	...	...	...	...
J	......	......	......	......	......	......	......	85	38	79.9	47.0	......	......	......	......	...	...	...	...
J	......	......	......	......	......	......	......	91	49	78.3	54.3	......	......	......	......	...	...	...	...
A	......	......	......	......	......	......	......	93	45	76.8	53.6	......	......	......	......	...	...	...	...
S	......	......	......	......	......	......	......	85	32	77.0	46.9	......	......	......	......	...	...	...	...
O	......	......	......	......	......	......	......	82	23	70.3	31.9	......	......	......	......	...	...	...	...
N	23,960	24.19	23.46	34.9	56.9	41.5	44.4	72	15	59.2	30.9	28.0	32.7	29.8	30.2	76	43	64	61
D	23,969	24.30	23.45	28.1	50.4	35.1	37.9	68	10	53.2	23.5	21.3	31.5	27.1	26.6	76	50	73	66
Y	......	......	......	......	......	......	......	93	−3	65.5	36.5	......	......	......	......	...	...	...	...

STOCKTON, FORT, TEX.

[Latitude, 30° 53′ N.; longitude, 102° 53′ W. Local time, 1.51 slow, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a. m.	Temperature. 3 p. m.	Temperature. 11 p. m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew point. 7 a. m.	Dew point. 3 p. m.	Dew point. 11 p. m.	Dew point. Mean.	Relative humidity. 7 a. m.	Relative humidity. 3 p. m.	Relative humidity. 11 p. m.	Relative humidity. Mean.
J	27,072	27.43	26.67	31.5	48.9	37.1	39.2	76	3	52.5	27.2	25.7	27.9	27.6	27.1	80	52	70	67
F	26,965	27.28	26.62	37.1	59.9	44.9	47.3	84	13	64.1	33.4	27.7	32.4	31.9	30.7	70	39	63	57
M	27,066	27.36	26.78	46.5	63.6	52.3	54.1	84	33	68.0	43.8	40.6	44.6	44.2	43.1	80	53	75	69
A	26,933	27.13	26.72	54.0	78.0	64.1	65.4	91	42	81.5	52.1	44.4	50.4	51.5	48.8	71	39	64	58
M	26,910	27.20	26.68	58.7	80.5	66.6	68.6	99	40	85.9	56.5	54.5	60.8	59.7	58.3	86	53	80	73
J	26,962	27.09	26.73	68.2	92.0	76.8	79.0	104	59	94.8	65.6	62.7	77.1	70.8	70.2	82	64	82	76
J	27,008	27.11	26.90	69.4	91.9	78.4	79.9	102	62	95.1	67.8	63.6	64.1	65.1	64.3	82	41	66	63
A	27,003	27.12	26.84	68.8	91.7	77.9	79.5	106	58	93.8	66.6	61.5	65.5	63.7	63.6	78	44	64	62
S	27,040	27.16	26.87	61.6	83.5	72.0	72.4	95	51	86.9	59.8	57.5	63.5	64.8	61.9	87	64	79	73
O	27,058	27.28	26.80	51.9	77.2	59.5	62.9	95	34	79.4	49.5	44.6	49.7	49.1	47.8	78	42	71	63
N	27,031	27.36	26.61	48.1	75.3	57.4	60.3	89	23	78.2	44.0	38.6	49.4	41.7	43.2	70	41	57	56
D	......	......	......	......	......	......	......	..	......	......	......	......	......	......	......	...	...	...	...
Y	......	......	......	......	......	......	......	106	......	......	......	......	......	......	......	...	..	...	...

SULLY, FORT, DAK.

[Latitude, 44° 39′ N.; longitude, 100° 39′ W. Local time, 1.43 slow, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a. m.	Temperature. 3 p. m.	Temperature. 11 p. m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew point. 7 a. m.	Dew point. 3 p. m.	Dew point. 11 p. m.	Dew point. Mean.	Relative humidity. 7 a. m.	Relative humidity. 3 p. m.	Relative humidity. 11 p. m.	Relative humidity. Mean.
J	......	......	......	......	......	......	......	50	−33	19.3	−4.8	......	......	......	......	...	...	...	...
F	......	......	......	......	......	......	......	58	25	22.6	0.9	......	......	......	......	...	...	...	...
M	......	......	......	......	......	......	......	67	27	49.2	23.4	......	......	......	......	...	...	...	...
A	......	......	......	......	......	......	......	80	21	65.0	37.4	......	......	......	......	...	...	...	...
M	......	......	......	......	......	......	......	89	27	73.7	45.9	......	......	......	......	...	...	...	...
J	......	......	......	......	......	......	......	97	36	81.7	53.8	......	......	......	......	...	...	...	...
J	......	......	......	......	......	......	......	108	45	90.8	61.8	......	......	......	......	...	...	...	...
A	......	......	......	......	......	......	......	103	45	80.8	56.9	......	......	......	......	...	...	...	...
S	......	......	......	......	......	......	......	98	34	77.1	49.0	......	......	......	......	...	...	...	...
O	......	......	......	......	......	......	......	87	19	65.9	31.9	......	......	......	......	...	...	...	...
N	......	......	......	......	......	......	......	57	10	46.2	23.5	......	......	......	......	...	...	...	...
D	28,300	28.76	27.81	18.6	35.5	25.3	26.5	66	−8	40.5	15.2	15.1	26.7	21.0	20.9	86	71	84	81
Y	......	......	......	......	......	......	......	108	−33	59.4	32.9	......	......	......	......	...	...	...	...

TATOOSH ISLAND, WASH.

[Latitude, 48° 23′ N.; longitude, 124° 44′ W. Local time, 3.19 slow, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 7 a. m.	Temperature. 3 p. m.	Temperature. 11 p. m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew point. 7 a. m.	Dew point. 3 p. m.	Dew point. 11 p. m.	Dew point. Mean.	Relative humidity. 7 a. m.	Relative humidity. 3 p. m.	Relative humidity. 11 p. m.	Relative humidity. Mean.
J	29,938	30.29	29.35	40.8	41.3	41.4	41.2	54	32	44.8	38.1	36.9	37.6	37.2	37.2	86	87	85	86
F	29,912	30.38	29.45	44.4	45.2	45.1	44.9	55	34	48.2	41.6	40.3	41.9	41.3	41.2	86	89	87	87
M	30,074	30.45	29.73	46.4	48.5	47.5	47.5	63	39	51.7	44.3	42.9	44.1	43.0	43.3	88	86	86	87
A	29,974	30.22	29.67	45.4	49.1	47.3	47.3	63	37	52.8	43.6	41.6	42.5	42.2	42.1	87	79	83	83
M	29,880	30.10	29.57	49.2	53.4	51.0	51.2	60	42	55.6	47.7	46.9	49.4	47.7	48.0	92	86	89	89
J	29,946	30.19	29.63	51.7	57.3	53.8	54.3	66	45	59.4	50.2	49.2	52.1	50.3	50.5	91	83	88	87
J	29,945	30.18	29.70	54.2	60.1	56.5	56.9	74	48	64.6	52.1	52.0	55.0	53.7	53.6	93	84	91	89
A	29,942	30.16	29.71	53.0	58.0	55.6	55.5	71	46	64.7	51.2	51.8	53.9	53.4	53.0	95	86	92	91
S	29,833	30.11	29.45	54.6	57.8	55.0	56.0	66	49	60.5	51.9	52.8	54.2	53.6	53.5	94	88	93	92
O	29,898	30.17	29.51	50.8	52.1	51.4	51.4	59	45	56.1	47.9	46.4	47.2	47.7	47.1	86	84	88	86
N	29,619	30.07	28.97	47.6	48.5	48.8	48.1	58	39	51.6	44.6	43.6	44.3	44.4	44.1	86	86	87	86
D	29,900	30.40	29.38	45.8	46.5	46.1	46.1	57	33	49.7	42.7	40.0	40.7	40.6	40.4	81	81	81	81
Y	29,905	30.45	28.97	48.7	51.5	50.0	50.1	74	32	55.0	46.3	45.4	46.9	46.3	46.2	89	85	87	87

Monthly and yearly meteorological summaries—Continued.

STANTON, FORT, N. MEX.

[H=6,150. h=1.]

Cloudiness (in tenths). 7 a. m.	3 p. m.	11 p. m.	Mean.	Wind. Total (miles).	Maximum.	Direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Precipitation. Total.	Max. 24 hours.	Number of days— Clear.	Fair.	Cloudy.	Rain or snow.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder-storms.	Auroras.	Months and year.
																In.											
																0.72					4					0	J.
																0.68					2					0	F.
																0.62					5					0	M.
																0.50					4					0	A.
																0.62					5					0	M.
																1.35					9					0	J.
																3.17					10					0	J.
																2.57					10					0	A.
																1.88					3					0	S.
																0.16					1					0	O.
2.6	2.7	2.5	2.6	5,269	38	NW.	3	0	1	5	4	3	31	42	1	0.50	0.28	16	11	1	5	0	17	0	0	0	N.
2.2	3.1	1.7	2.3	5,276	35	NW.	2	2	2	6	8	8	24	37	4	0.35	0.25	20	10	1	4	1	26	0	0	0	D.
																12.57					62					0	Y.

STOCKTON, FORT, TEX.

[H=3,004. h=1.]

SULLY, FORT, DAK.

[H=1,600. h=6.]

7 a. m.	3 p. m.	11 p. m.	Mean.	Total (miles).	Maximum.	Direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Total.	Max. 24 hours.	Clear.	Fair.	Cloudy.	Rain or snow.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder-storms.	Auroras.	Months and year.
																0.87					7					0	J.
																0.80					[illegible]					0	F.
																0.06					2					0	M.
																2.39					9					0	A.
																2.70					12					0	M.
																5.12					16					0	J.
																2.71					16					0	J.
																4.50					10					0	A.
																1.77					5					2	S.
																0.12					3					0	O.
																0.55					4					1	N.
5.6	5.6	4.5	5.3	6,562	58	N.	14	8	3	24	6	1	8	33	6	0.14	0.04	4	21	6	7	8	29	0	0	1	D.
																20.82					103					4	Y.

TATOOSH ISLAND, WASH.

[H=86. h=1.]

Monthly and yearly meteorological summaries—Continued.

THOMAS, FORT, ARIZ.

[Latitude, 33° 4′ N.; longitude, 110° 2′ W. Local time, 2.20 slow, Eastern.]

Months and year.	Pressure. Mean.	Pressure. Maximum.	Pressure. Minimum.	Temperature. 4.40 a.m.	Temperature. 12.40 p.m.	Temperature. 8.40 p.m.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew point. 7 a.m.	Dew point. 3 p.m.	Dew point. 11 p.m.	Dew point. Mean.	Relative humidity. 7 a.m.	Relative humidity. 3 p.m.	Relative humidity. 11 p.m.	Relative humidity. Mean.
	In.	In.	In.	°	°	°	°	°	°	°	°	°	°	°	°				
J..	27,322	27.55	27.02	28.5	52.1	38.5	39.7	62	16	58.2	26.0	19.2	35.8	29.0	28.0	68	54	68	63
F..	27,222	27.51	26.92	31.6	59.7	46.7	46.0	72	20	63.3	29.8	22.2	27.8	31.9	27.3	68	32	58	53
M.	27,264	27.50	27.09	43.5	66.8	57.2	55.8	80	31	70.6	41.6	36.1	35.2	41.0	37.4	76	33	57	55
A..	27,150	27.39	26.98	45.2	74.6	62.1	60.6	88	29	77.6	43.9	35.8	32.3	38.5	35.5	70	22	43	45
M.	27,104	27.22	26.95	53.0	84.0	70.7	69.2	99	40	87.5	51.4	38.6	36.3	43.6	39.5	59	19	40	39
J..	27,173	27.33	26.98	59.7	90.5	77.2	75.8	102	43	94.1	56.9	40.8	40.3	44.6	41.9	52	19	35	35
J..	27,187	27.33	27.05	69.7	95.6	84.5	83.3	106	56	99.8	68.2	49.5	50.6	54.7	51.6	50	23	39	37
A..	26,192	27.33	27.08	69.1	92.3	83.0	81.5	104	60	96.2	67.7	53.9	55.6	57.3	55.6	60	31	45	45
S..	27,178	27.33	27.03	60.0	90.2	75.2	75.1	98	43	92.4	56.5	43.4	44.4	47.8	45.2	57	22	41	40
O..	27,220	27.40	27.03	44.7	79.7	60.8	61.7	91	31	82.2	42.4	29.5	36.4	37.4	34.4	56	32	44	41
N..	27,271	27.49	26.88	37.1	65.9	50.7	51.2	80	26	67.2	35.8	28.9	36.1	40.2	35.1	72	36	69	59
D..	27,332	27.61	26.88	29.2	55.9	43.2	42.8	71	12	60.7	27.6	26.2	31.2	34.1	30.5	88	44	72	68
Y..	27,551	27.61	26.88	47.6	75.6	62.5	61.9	106	12	78.7	45.6	35.3	38.5	41.7	38.5	65	30	51	48

TOLEDO, OHIO.

[Latitude, 41° 40′; longitude, 83° 34′ W. Local time, 0.34 slow, Eastern.]

J..	29,385	29.97	28.54	18.5	25.7	21.2	21.8	50	-10	28.6	13.1	13.0	16.2	18.1	14.1	79	67	71	72
F..	29,281	29.83	28.55	12.4	22.2	17.8	17.5	59	-15	26.6	7.4	6.2	13.0	10.8	9.8	75	68	73	72
M..	29,352	29.72	28.76	23.7	32.7	28.0	28.1	56	-2	35.7	19.7	17.1	22.1	20.5	19.9	75	65	74	71
A..	29,332	29.66	28.74	42.0	51.0	44.9	46.0	80	22	54.6	37.5	36.0	36.7	37.4	36.7	80	61	76	72
M..	29,237	29.53	28.88	53.1	68.7	56.8	57.9	83	32	65.6	49.2	46.1	46.8	48.1	47.0	78	58	74	70
J..	29,333	29.58	28.93	64.8	74.4	66.2	68.3	89	45	76.5	57.9	55.6	57.7	57.8	56.9	74	57	73	68
J..	29,287	29.53	29.03	70.4	81.5	74.0	75.3	93	54	83.7	66.8	63.8	67.2	66.9	66.0	80	62	79	74
A..	29,287	29.60	28.79	62.9	71.8	66.1	66.9	89	48	74.7	59.8	59.4	61.9	61.2	60.8	88	72	84	82
S..	29,361	29.63	28.82	57.3	66.8	62.0	63.0	82	40	71.5	54.9	53.2	57.4	56.0	55.5	86	66	81	78
O..	29,289	29.66	28.80	45.9	55.3	49.7	50.3	74	28	58.0	43.6	43.5	46.7	45.4	45.2	91	74	86	83
N..	29,250	29.70	28.87	39.3	45.2	42.0	42.2	68	26	47.5	36.8	35.5	38.6	37.5	37.2	86	78	84	83
D..	20,327	29.98	28.45	27.3	33.6	29.6	30.2	55	-2	37.0	23.0	22.5	24.9	23.7	23.7	82	70	79	77
Y..	20,811	29.98	28.45	43.1	52.2	46.5	47.3	93	-15	55.0	39.1	37.7	40.8	39.8	39.4	81	67	76	75

TOTTEN, FORT, DAK.

[Latitude, 47° 57′ N.; longitude, 98° 57′ W. Local time, 1.36 slow, Eastern.]

J..	28,392	28.92	27.73	-7.5	-0.5	-6.2	-4.7	39	-37	3.9	-17.0	-14.3	-8.5	-12.4	-11.7	72	69	74	72
F..	28,356	28.82	27.82	-7.0	3.8	-2.2	-2.0	39	-34	7.6	-10.3	-13.1	-2.3	-8.1	-7.8	73	77	75	75
M.	28,443	28.85	27.84	14.0	21.5	17.5	17.7	40	-20	27.3	9.1	9.8	17.2	12.9	13.3	83	83	83	82
A..	28,312	28.58	27.78	33.6	47.2	38.6	39.8	74	14	51.7	32.1	30.0	33.3	33.6	32.3	87	63	83	77
M.	28,307	28.64	27.95	44.5	58.3	49.7	50.8	86	20	64.4	40.5	37.9	39.1	41.4	39.5	78	53	74	68
J..	28,363	28.71	27.71	55.3	67.5	57.7	60.2	88	35	72.8	49.3	50.5	51.8	52.0	51.4	84	60	82	75
J..	28,298	28.56	27.86	60.4	72.4	63.2	65.3	93	43	77.5	56.5	55.7	59.1	58.5	57.8	85	64	84	78
A..	28,387	28.73	28.05	53.2	68.8	58.0	60.0	86	35	71.8	49.6	49.0	57.5	51.8	50.8	86	56	81	74
S..	28,322	28.74	27.85	44.6	65.7	52.0	54.1	96	29	68.1	41.7	38.9	39.1	41.4	39.8	81	42	69	64
O..	28,382	28.72	27.92	32.4	49.7	37.4	39.8	79	20	52.0	29.8	27.2	28.8	28.4	28.1	81	50	71	68
N..	28,355	28.64	28.01	22.9	30.1	25.0	26.0	44	3	31.9	20.5	19.8	24.1	21.4	21.8	87	78	85	84
D..	28,343	28.85	27.79	9.3	19.4	12.1	13.6	43	-20	25.0	2.2	5.1	12.5	8.7	8.8	83	74	85	81
Y..	28,355	28.92	27.71	29.6	42.0	33.5	35.0	96	-37	46.2	25.3	24.7	28.8	27.5	27.0	82	64	79	75

UNALASKA, ALASKA.

[Latitude, 53° 53′ N.; longitude, 166° 32′ W. Local time, 6.6 slow, Eastern.]

J..	29,272	29.97	28.54	36.8	37.1	37.6	37.2	44	24	40.4	32.8	33.2	32.9	33.9	33.3	87	85	86	86
F..	29,680	30.32	29.12	27.0	27.7	27.5	27.4	44	9	32.3	21.8	21.6	22.0	21.4	21.7	79	78	77	78
M.	29,596	30.34	28.43	30.5	32.1	32.5	31.7	51	13	37.7	26.5	24.9	26.5	26.5	26.0	80	79	79	79
A..	29,657	30.33	28.60	35.0	37.4	37.5	36.6	50	20	42.7	30.5	28.8	30.0	30.0	29.6	78	75	75	76
M.	23,787	30.38	29.09	39.4	42.1	43.5	41.7	58	31	48.9	35.8	32.4	33.6	34.3	33.4	76	72	70	73
J..	29,883	30.45	29.09	42.9	45.7	47.0	45.2	60	34	51.8	40.2	38.2	39.2	40.4	39.3	83	78	79	80
J..	29,880	30.50	29.26	46.7	49.0	50.6	48.8	62	39	55.1	43.6	43.5	44.5	44.8	44.3	89	85	81	85
A..	29,870	30.36	29.42	48.5	50.4	52.0	50.3	64	40	56.3	44.6	45.3	46.0	47.2	46.2	89	85	81	86
S..	29,079	30.32	28.52	44.1	45.7	45.6	45.1	59	34	50.0	40.1	39.8	40.7	41.1	40.5	85	83	85	84
O..	29,368	30.10	28.52	41.3	41.7	41.1	41.5	54	30	45.9	36.0	37.1	38.2	37.5	37.6	85	87	86	86
N..	29,593	30.29	28.59	35.4	35.6	35.4	35.5	53	23	40.8	31.5	28.6	27.6	27.4	27.9	77	72	73	74
D..	29,585	30.25	28.85	33.8	33.8	34.2	33.9	46	23	38.5	30.4	26.8	26.6	26.5	26.6	75	75	73	74
Y..	29.654	30.50	28.43	38.4	39.9	40.4	39.6	64	9	45.0	34.5	33.4	34.0	34.2	33.9	82	80	79	80

Monthly and yearly meteorological summaries—Continued.

THOMAS, FORT, ARIZ.
[H=2,710. h=2.]

TOLEDO, OHIO.
[H=651. h=106.]

TOTTEN, FORT, DAK.
[H=1,490. h=2.]

UNALASKA, ALASKA.
[H=13. h=2.]

8.0	7.6	9.1	8.2	8,407	42	E.	2	3	17	31	21	11	2	2	4	29.67	5.85	0	9	22	29	0	11	0	0	0
7.6	8.2	7.5	7.7	7,026	36	NW.	18	8	4	9	12	12	6	18	2	4.42	1.74	1	10	17	15	14	23	0	0	0
8.9	9.1	8.4	8.8	9,625	36	SE.	9	7	10	15	13	10	1	22	4	8.42	1.60	0	8	23	24	9	[illegible]	0	0	0
8.1	7.5	8.0	7.9	9,220	56	SW.	3	0	1	19	12	42	5	8	0	12.40	3.06	0	12	18	21	1	17	0	0	0
7.7	7.4	6.2	7.1	7,360	38	W.	7	10	4	23	12	23	6	7	1	1.47	0.68	2	[illegible]	16	11	0	2	0	0	0
8.0	1.4	9.2	8.5	6,235	26	SE.	9	29	2	14	4	16	5	8	3	2.03	0.54	0	8	22	12	0	0	0	0	0
9.9	9.5	8.1	9.2	7,164	40	NE.	12	32	7	13	10	13	0	3	3	4.15	1.15	0	3	28	18	0	0	0	0	0
7.4	6.6	6.9	7.0	6,396	32	SE	3	16	0	18	7	20	12	4	4	3.84	0.92	2	15	14	16	0	0	0	0	0
9.6	8.3	9.1	9.0	9,536	50	NW	8	6	3	9	5	8	24	26	1	7.64	2.43	0	4	26	26	0	0	0	0	0
8.5	7.9	8.4	8.3	10,185	44	NW.	5	5	1	13	16	14	10	28	11	17.60	5.38	1	11	19	30	0	4	0	0	0
8.6	7.9	8.6	8.4	10,165	48	NW.	6	3	1	4	21	22	15	17	1	8.75	2.60	0	10	20	22	0	15	0	0	0
6.9	7.8	6.8	7.0	9,169	42	W.	3	0	3	12	26	31	7	10	1	8.08	1.60	1	16	14	23	0	20	0	0	0
8.3	8.0	8.0	8.1	100,490	..	....	85	114	59	180	161	231	93	153	25	108.17	5.85	7	119	230	246	24	119	0	0	0

Monthly and yearly meteorological summaries—Continued.

VALENTINE, NEBR.

[Latitude, 42° 50′ N.; longitude, 100° 32′ W. Local time, 1.42 slow, Eastern.]

Months and year.	Pressure.			Temperature.								Dew point.				Relative humidity.			
	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	Mean. Maximum.	Mean. Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.
	In.	In.	In.	°	°	°	°	°	°	°	°	°	°	°	°				
J																			
F																			
M																			
A																			
M																			
J																			
J																			
A																			
S	27.286	27.64	26.83	50.1	70.7	58.5	59.8	94	35	74.0	48.0	43.7	21.7	44.3	43.2	80	42	63	61
O	27.320	27.56	26.93	37.4	57.4	44.3	46.4	87	22	61.0	34.5	30.3	26.8	32.0	29.7	77	36	64	59
N	27.230	27.60	26.74	29.2	47.0	35.7	37.3	69	16	50.7	27.0	24.8	28.6	28.6	27.3	83	52	76	70
D	27.284	27.70	26.79	20.1	38.9	27.4	28.8	68	9	43.2	16.9	14.3	20.7	19.4	18.1	77	51	73	67
Y																			

VICKSBURG, MISS.

[Latitude, 32° 22′ N.; longitude, 90° 53′ W. Local time 1.3 slow, Eastern.]

J	30,000	30.47	29.46	38.9	50.0	44.5	44.5	75	19	52.5	36.1	32.4	37.8	35.6	35.3	78	64	71	71
F	29,877	30.22	29.37	40.7	53.0	46.4	46.7	73	17	56.2	36.7	34.3	36.6	34.9	35.3	78	56	66	66
M	29,950	30.87	29.57	47.4	61.4	54.5	54.4	77	27	64.9	44.5	37.8	38.6	37.1	37.8	70	46	54	57
A	29,824	30.17	29.54	59.9	75.4	66.2	67.2	91	42	76.3	56.4	51.8	53.4	52.5	52.6	75	50	64	63
M	29,732	29.93	29.38	65.1	79.2	68.9	71.1	90	51	81.2	62.5	56.2	60.7	58.4	58.4	73	55	70	66
J	29,828	29.97	29.59	74.6	89.9	77.9	80.8	96	61	91.6	70.5	67.5	68.0	69.3	68.3	79	49	76	68
J	29,825	30.01	29.64	75.5	89.7	77.2	80.8	99	64	92.4	72.3	70.8	72.3	71.5	71.5	86	58	83	76
A	29,782	29.96	29.61	73.2	87.9	77.8	79.6	97	62	90.3	71.6	70.3	70.2	71.9	70.8	91	57	82	77
S	29,773	29.94	29.61	68.8	80.9	72.0	73.9	92	53	83.4	67.1	65.7	67.6	67.4	66.9	90	67	86	81
O	29,822	30.15	29.55	53.8	69.6	60.2	61.2	82	38	72.0	52.4	50.1	52.2	52.3	51.5	88	56	76	73
N	29,859	30.15	29.47	48.5	65.0	54.8	56.1	85	31	86.9	40.8	42.6	42.2	43.9	42.9	81	47	68	65
D	29,977	30.34	29.25	41.3	56.5	48.2	48.7	73	22	59.5	39.2	33.5	35.6	34.6	34.6	75	48	62	62
Y	29,854	30.44	29.25	57.3	71.5	62.4	63.7	99	17	73.9	54.7	51.1	52.9	52.4	52.1	80	54	72	69

WALLA WALLA, WASH.

[Latitude, 46° 2′ N.; longitude, 118° 20′ W. Local time 2.53 slow, Eastern.]

J																			
F																			
M																			
A																			
M																			
J																			
J																			
A																			
S																			
O																			
N																			
D	29.032	29.53	28.49	38.0	43.8	41.8	41.2	62	22	48.3	35.2	33.3	35.3	33.7	34.1	84	73	73	77
Y																			

WASHINGTON, D. C.

[Latitude, 38° 54′ N.; longitude, 77° 3′ W. Local time 0.8 slow, Eastern.]

J	30,038	30.75	29.24	29.9	36.6	32.8	32.9	66	10	42.6	24.8	24.2	23.7	24.2	24.0	79	61	78	71
F	29,914	30.40	29.09	22.8	31.9	25.9	26.9	51	2	34.4	19.6	18.5	18.8	18.6	18.6	83	59	74	72
M	29,968	30.38	29.53	29.5	40.7	33.4	34.5	70	10	43.1	26.6	23.7	25.1	23.3	24.0	79	56	67	67
A	29,956	30.51	29.45	45.7	62.5	51.2	53.1	86	30	64.5	42.8	36.8	37.0	39.3	37.7	72	42	65	59
M	29,861	30.09	29.41	57.8	69.3	59.7	62.3	86	40	71.2	53.5	50.7	48.7	50.5	50.0	78	53	73	68
	29.937	30.21	29.43	66.6	78.6	68.1	71.1	95	52	80.8	61.8	58.2	56.6	58.6	57.8	75	50	72	68
J	29,880	30.08	29.62	72.5	85.8	75.2	77.8	99	54	87.9	68.8	65.7	64.0	67.1	65.6	80	50	76	69
J	29,885	30.16	29.51	68.5	81.4	70.4	73.4	94	51	82.7	65.1	63.1	63.7	64.2	63.7	83	56	81	74
A	29,985	30.26	29.45	59.5	75.3	63.6	66.1	91	44	76.1	57.2	54.0	55.0	57.0	55.3	83	51	80	71
S	29,910	30.25	29.05	49.5	62.1	52.5	54.7	75	35	64.2	46.7	46.6	47.1	48.5	47.4	90	59	87	79
O	29,877	30.28	29.52	41.2	50.9	43.8	45.3	71	30	52.1	38.7	36.4	38.7	37.9	37.7	83	65	80	76
N	29,961	30.70	29.19	33.1	42.8	36.6	37.5	64	14	45.8	30.4	26.8	27.9	28.0	27.6	78	57	71	69
D	29,931	30.75	29.05	48.0	59.8	51.1	53.0	99	2	62.1	44.7	42.0	42.2	43.1	42.4	80	55	75	70
Y																			

Monthly and yearly meteorological summaries—Continued.

VALENTINE, NEBR.

[H = 2006. λ = 42.]

Cloudiness (in tenths).				Wind.												Precipitation.		Number of days—									
7 a.m.	3 p.m.	11 p.m.	Mean.	Total (miles).	Maximum.	Direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Total.	Max., 24 hours.	Clear.	Fair.	Cloudy.	Rain or snow.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunderstorms.	Auroras.	Months and year.
																In.	In.										
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	J.
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	F.
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	M.
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	A.
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	M.
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	J.
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	J.
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	A.
4.0	4.5	2.2	3.9	7,410	54	N.	20	8	9	10	21	11	8	3	5	2.23	1.25	15	9	6	6	0	0	5	1	1	S.
4.0	5.4	3.6	4.0	7,656	52	N.	10	8	0	2	12	16	14	22	4	0.98	0.54	12	11	8	6	0	11	0	0	0	O.
5.4	4.7	4.0	5.0	7,462	64	N.W.	4	0	9	3	12	18	13	21	9	0.81	0.27	9	12	9	2	0	26	0	0	0	N.
5.9	7.2	4.3	5.8	8,000	72	N.W.	12	0	3	3	0	24	17	23	0	0.15	0.05	4	20	7	3	8	29	0	0	0	D.
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	Y.

VICKSBURG, MISS.

[H = 260. λ = 45.]

WALLA WALLA, WASH.

[H = 1,018. λ = 57.]

7 a.m.	3 p.m.	11 p.m.	Mean.	Total (miles).	Maximum.	Direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Total.	Max., 24 hours.	Clear.	Fair.	Cloudy.	Rain or snow.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunderstorms.	Auroras.	Months and year.
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	J.
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	F.
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	M.
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	A.
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	M.
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	J.
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	J.
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	A.
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	S.
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	O.
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	N.
7.4	8.9	5.8	6.7	3,672	30	SW.	2	0	0	11	3	55	10	5	7	1.92	.49	2	15	14	18	0	7	0	0	0	D.
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	Y.

WASHINGTON, D. C.

[H = 106. λ = 51.]

Monthly and yearly meteorological summaries—Continued.

YUMA, ARIZ.

[Latitude, 32° 45′ N.; longitude, 114° 36′ W. Local time, 2.38 slow, Eastern.]

Months and year.	Pressure.			Temperature.								Dew point.				Relative humidity.			
										Mean.									
	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.
	In.	In.	In.	°	°	°	°	°	°	°	°	°	°	°	°				
J....	29.960	30.23	29.61	44.9	60.7	52.1	52.6	77	35	64.5	41.6	34.3	38.6	37.1	36.7	68	45	59	57
F..	29.852	30.13	29.52	49.3	70.5	59.5	59.8	84	38	74.2	45.0	49.8	43.0	42.4	41.9	71	39	54	55
M...	29.845	30.22	29.67	57.2	77.0	67.5	67.2	87	43	81.1	54.5	47.0	50.5	49.5	49.0	72	40	54	55
A....	29.735	29.98	29.46	59.8	81.0	71.3	70.7	96	51	84.5	58.0	49.0	50.2	51.5	50.4	70	26	52	53
M...	29.629	29.77	29.47	65.0	90.3	79.4	78.2	110	57	94.8	63.1	55.4	53.5	54.7	54.5	73	30	43	49
J....	29.685	29.84	29.53	68.8	92.5	82.3	81.2	104	60	97.3	67.1	57.6	60.9	59.4	59.3	68	25	47	50
J....	29.663	29.85	29.51	77.7	100.6	88.9	89.1	110	67	105.0	76.0	68.2	75.9	72.5	72.2	73	46	59	60
A....	29.642	29.79	29.51	81.3	99.7	90.6	90.5	114	70	104.6	79.1	74.7	77.1	76.6	76.1	82	51	68	65
S..	29.630	29.77	29.46	78.0	96.2	84.8	84.7	107	62	100.7	71.2	65.0	74.6	72.0	70.5	77	50	66	65
O....	29.718	29.98	29.52	63.6	87.0	73.6	74.7	106	51	90.6	61.4	54.8	63.6	58.8	59.1	75	46	61	61
N....	29.833	30.05	29.44	55.4	71.9	62.5	63.3	86	41	74.3	49.3	47.7	54.2	52.4	51.4	78	55	71	68
D....	29.932	30.23	29.57	50.9	65.5	56.2	57.5	78	40	68.2	48.1	39.8	40.0	41.6	40.3	68	41	60	57
Y....	29.760	30.23	29.44	62.2	82.7	72.4	72.4	114	35	86.6	59.6	52.8	56.9	55.7	55.1	73	43	57	58

Monthly and yearly meteorological summaries—Continued.

YUMA, ARIZ.

[$H=141$. $h=21$.]

Cloudiness (in tenths).				Wind.												Precipitation.		Number of days—									
7 a. m.	3 p. m.	11 p. m.	Mean.	Total (miles).	Maximum.	Direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Total.	Max. 24 hours.	Clear.	Fair.	Cloudy.	Rain or snow.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder-storms.	Auroras.	Months and year.
1.8	3.0	1.7	2.4	4,253	28	NE.	7	52	3	1	4	1	2	19	4	.—	.—	20	9	2	0	0	0	0	0	0	J.
2.0	3.1	1.0	2.0	2,264	26	SW., N.	3	24	3	5	3	9	3	27	6	0.02	0.02	18	9	0	1	0	0	0	0	0	F.
3.9	5.0	3.9	4.3	4,180	28	NW.	5	30	0	7	2	21	2	20	6	.—	.—	10	16	5	0	0	0	0	1	0	M.
2.2	3.9	2.1	2.7	5,646	48	NW.	1	9	1	5	0	27	4	40	3	0.07	0.07	16	14	0	1	0	0	5	0	0	A.
1.8	2.7	1.2	1.9	4,394	22	SW.	0	6	0	15	4	33	3	18	14	.—	.—	22	9	0	0	0	0	24	0	0	M.
2.8	3.0	2.4	2.7	4,684	32	NW.	1	7	0	13	5	22	4	26	12	0.00	0.00	21	6	3	0	0	0	27	0	0	J.
3.0	2.4	1.6	2.3	5,174	26	SW.	0	2	0	22	11	28	5	11	14	0.05	0.05	21	8	2	1	0	0	31	0	0	J.
4.4	3.8	3.6	3.9	4,677	36	SE.	0	11	1	35	2	33	0	0	11	0.86	0.58	14	13	4	0	0	0	31	0	0	A.
0.8	1.3	0.7	0.9	2,941	21	SW.	1	20	1	18	1	27	1	9	12	0.00	0.00	27	3	0	0	0	0	30	0	0	S.
0.5	1.2	0.1	0.6	....	20	NW.	1	42	4	11	0	11	1	14	7	0.00	0.00	27	2	0	0	0	0	9	0	0	O.
1.7	3.8	2.4	2.6	3,886	30	NW.	14	30	1	6	2	9	4	12	12	1.71	1.71	18	11	1	2	0	0	0	0	0	N.
2.8	3.1	2.4	2.6	4,071	32	N.	45	16	10	0	3	2	4	4	9	0.01	0.01	18	9	4	1	0	0	0	0	0	D.
2.3	3.1	1.9	2.4	....	...	....	78	249	24	138	37	223	33	200	110	2.72	1.71	232	109	21	12	0	0	157	1	0	Y.

APPENDIX 29.

Mean range of atmospheric pressure at stations of the Signal Service, United States Army, for each month of the year. (Computed from January, 1880, to December, 1885, inclusive, except at stations opened subsequent to the former date.)

Districts and stations.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
	Inch.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*
New England:												
Eastport, Me	1.44	1.58	1.34	1.24	0.94	0.90	0.72	0.68	1.04	1.20	1.29	1.48
Portland, Me	1.36	1.54	1.28	1.15	0.86	0.89	0.67	0.71	0.95	1.15	1.15	1.44
Mt. Washington, N. H.	1.04	1.26	1.06	1.05	0.80	0.76	0.66	0.58	0.83	0.95	1.12	1.32
Boston, Mass	1.36	1.47	1.25	1.15	0.83	0.85	0.63	0.60	0.87	1.07	1.07	1.29
Block Island, R. I	1.41	1.46	1.23	1.15	0.88	0.81	0.61	0.64	0.79	1.00	1.03	1.22
New Haven, Conn	1.38	1.43	1.16	1.03	0.82	0.78	0.58	0.68	0.82	1.02	0.95	1.19
New London, Conn	1.38	1.48	1.22	1.08	0.85	0.80	0.60	0.67	0.83	1.04	1.01	1.24
Middle Atlantic States:												
Albany, N. Y	1.40	1.37	1.14	1.01	0.77	0.82	0.61	0.70	0.84	0.97	1.02	1.28
New York City	1.40	1.34	1.11	1.01	0.80	0.77	0.57	0.69	0.78	1.00	1.00	1.14
Philadelphia, Pa	1.43	1.34	1.11	0.96	0.80	0.73	0.54	0.66	0.76	0.98	0.98	1.11
Atlantic City, N. J	1.39	1.38	1.12	0.98	0.80	0.73	0.55	0.63	0.75	0.98	0.96	1.10
Barnegat City, N. J.[1]	1.45	1.41	1.14	0.99	0.80	0.75	0.56	0.65	0.75	0.99	0.97	1.10
Cape May, N. J.[2]	1.36	1.33	1.08	0.95	0.78	0.69	0.51	0.62	0.74	0.95	0.98	1.02
Sandy Hook, N. J	1.43	1.45	1.12	1.00	0.81	0.77	0.57	0.67	0.77	0.99	0.97	1.15
Baltimore, Md	1.34	1.31	1.10	0.94	0.78	0.71	0.53	0.64	0.73	0.96	0.96	1.11
Washington City	1.34	1.30	1.05	0.94	0.78	0.71	0.52	0.63	0.71	0.94	0.94	1.11
Cape Henry, Va	1.30	1.26	1.06	0.94	0.74	0.65	0.55	0.58	0.66	0.89	0.90	1.05
Chincoteague, Va	1.40	1.31	1.09	0.94	0.76	0.67	0.54	0.59	0.71	0.92	0.92	1.07
Lynchburg, Va	1.19	1.15	0.98	0.86	0.71	0.66	0.50	0.56	0.64	0.85	0.86	1.01
Norfolk, Va	1.24	1.23	1.03	0.92	0.72	0.62	0.51	0.54	0.63	0.84	0.86	1.02
South Atlantic States:												
Charlotte, N. C	1.04	0.99	0.87	0.78	0.63	0.56	0.46	0.47	0.54	0.71	0.79	0.89
Hatteras, N. C	1.23	1.11	0.97	0.98	0.72	0.54	0.51	0.50	0.62	0.78	0.88	0.95
Kitty Hawk, N. C	1.21	1.20	1.02	0.94	0.72	0.62	0.52	0.54	0.64	0.83	0.88	0.99
Macon, Fort, N. C	1.15	1.06	0.89	0.94	0.69	0.51	0.51	0.51	0.60	0.74	0.85	0.90
Smithville, N. C	1.05	1.02	0.89	0.82	0.64	0.50	0.46	0.47	0.64	0.69	0.80	0.86
Wilmington, N. C	1.06	1.05	0.89	0.83	0.65	0.52	0.47	0.50	0.72	0.71	......	......
Charleston, S. C	0.96	0.89	0.81	0.76	0.58	0.46	0.41	0.62	0.53	0.65	0.76	0.79
Augusta, Ga	0.98	0.92	0.81	0.71	0.59	0.50	0.45	0.45	0.54	0.68	0.75	0.84
Savannah, Ga	0.90	0.83	0.75	0.59	0.54	0.45	0.40	0.53	0.48	0.63	0.73	0.74
Jacksonville, Fla	0.84	0.71	0.67	0.60	0.50	0.40	0.37	0.44	0.45	0.58	0.63	0.64
Florida Peninsula:												
Cedar Keys, Fla	0.74	0.57	0.55	0.52	0.42	0.34	0.31	0.42	0.38	0.52	0.54	0.57
Key West, Fla	0.47	0.38	0.39	0.38	0.34	0.27	0.23	0.28	0.26	0.37	0.39	0.38
Sanford, Fla	0.69	0.64	0.50	0.55	0.46	0.31	0.32	0.34	0.36	0.47	0.46	0.45
Eastern Gulf States:												
Atlanta, Ga	0.88	0.83	0.72	0.61	0.53	0.46	0.39	0.41	0.51	0.59	0.69	0.76
Pensacola, Fla	0.77	0.78	0.65	0.58	0.48	0.39	0.35	0.46	0.48	0.51	0.66	0.72
Mobile, Ala	0.78	0.83	0.68	0.62	0.49	0.38	0.33	0.44	0.48	0.53	0.71	0.77
Montgomery, Ala	0.82	0.79	0.70	0.64	0.57	0.41	0.36	0.44	0.48	0.56	0.71	0.77
Vicksburg, Miss	0.88	0.92	0.74	0.74	0.51	0.39	0.31	0.38	0.45	0.50	0.77	0.91
New Orleans, La	0.77	0.81	0.68	0.62	0.44	0.34	0.28	0.36	0.40	0.49	0.73	0.77
Western Gulf States:												
Shreveport, La	0.90	0.94	0.78	0.76	0.54	0.40	0.31	0.36	0.40	0.60	0.86	0.98
Fort Smith, Ark	1.10	1.00	0.85	0.83	0.60	0.45	0.41	0.38	0.45	0.72	0.96	1.07
Little Rock, Ark	0.99	0.96	0.85	0.82	0.58	0.45	0.36	0.39	0.45	0.63	0.87	1.08
Galveston, Tex	0.77	0.81	0.71	0.69	0.48	0.33	0.27	0.33	0.37	0.52	0.77	0.82
Indianola, Tex	0.78	0.85	0.71	0.73	0.48	0.33	0.27	0.31	0.37	0.52	0.80	0.88
Palestine, Tex	0.82	0.88	0.82	0.73	0.53	0.40	0.34	0.32	0.40	0.56	0.82	0.97
San Antonio, Tex	0.71	0.92	0.68	0.66	0.52	0.36	0.30	0.31	0.40	0.55	0.79	0.88
Rio Grande Valley:												
Brownsville, Tex	0.73	0.80	0.67	0.67	0.42	0.30	0.24	0.42	0.32	0.48	0.75	0.84
Rio Grande City, Tex.	0.70	0.86	0.72	0.68	0.52	0.33	0.28	0.38	0.38	0.51	0.87	0.88
Ohio Valley and Tennessee:												
Chattanooga, Tenn	0.92	0.91	0.82	0.68	0.57	0.48	0.41	0.40	0.50	0.62	0.78	0.84
Knoxville, Tenn	0.96	0.92	0.79	0.68	0.59	0.50	0.42	0.40	0.49	0.64	0.75	0.87
Memphis, Tenn	1.01	1.00	0.81	0.81	0.59	0.46	0.36	0.42	0.45	0.60	0.86	1.03
Nashville, Tenn	1.04	0.97	0.85	0.77	0.62	0.50	0.41	0.41	0.49	0.60	0.78	0.96

[1] Station closed December 31, 1885. [2] Station closed October 31, 1885.

Mean range of atmospheric pressure at stations of the Signal Service, &c.—Continued.

nessee—Continued:	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*
Louisville, Ky	1.05	1.06	[illegible]	0.78	0.66	0.57	0.44	0.48	0.56	0.67	0.85	1.07
Greencastle, Ind	1.33	1.14	0.86	0.74	0.69	0.60	0.37	0.58	0.72	0.71	0.84	1.26
Indianapolis, Ind	1.18	1.10	1.01	0.80	0.71	0.62	0.48	0.53	0.65	0.76	0.90	1.13
Cincinnati, Ohio	1.15	1.13	0.87	0.81	0.70	0.60	0.48	0.63	0.58	0.72	0.88	1.00
Columbus, Ohio	1.14	1.11	0.86	0.85	0.71	0.63	0.49	0.56	[illegible]	0.77	0.93	0.95
Pittsburg, Pa	1.20	1.18	1.03	0.86	0.75	0.66	0.47	[illegible]	0.63	0.80	0.91	1.06
Lower Lakes:												
Buffalo, N. Y	1.30	1.25	1.12	[illegible]	0.76	0.72	0.55	0.69	0.78	0.92	1.01	1.29
Oswego, N. Y	1.34	1.30	1.17	0.89	0.76	0.77	0.58	0.71	0.80	0.98	1.04	1.25
Rochester, N. Y	[illegible]	1.27	1.14	0.98	0.75	0.74	0.56	0.71	0.73	0.94	1.03	1.05
Erie, Pa	1.34	1.34	1.13	0.84	0.78	0.70	0.50	0.66	0.72	0.89	0.96	1.16
Cleveland, Ohio	1.21	1.22	1.07	0.89	0.77	0.70	0.51	0.00	0.66	0.85	0.94	1.14
Sandusky, Ohio	1.30	1.29	1.11	0.84	0.76	0.69	0.47	0.63	0.69	0.84	1.00	1.15
Toledo, Ohio	1.21	1.16	1.10	0.88	0.75	0.71	0.51	0.61	0.71	0.85	1.00	1.16
Detroit, Mich	1.34	1.41	1.15	0.95	0.80	0.72	0.52	0.64	0.75	0.90	1.02	1.18
Upper Lakes:												
Alpena, Mich	1.32	1.32	1.34	1.09	0.85	0.79	0.62	0.72	0.80	0.97	1.09	1.23
Escanaba, Mich	1.25	1.27	1.29	1.02	[illegible]	0.80	0.66	0.71	0.68	1.00	1.10	1.29
Grand Haven, Mich	1.22	1.23	1.30	0.96	0.80	0.71	0.52	0.61	0.70	0.93	1.02	1.21
Mackinaw City, Mich	1.37	1.17	1.28	1.06	0.79	0.78	0.67	0.80	1.00	1.05	1.03	1.24
Marquette, Mich	1.20	1.31	1.24	1.03	0.84	0.78	0.70	0.75	0.98	1.09	1.10	1.19
Port Huron, Mich	[illegible]	1.21	1.17	[illegible]	0.79	0.72	0.55	0.68	0.77	0.93	1.03	1.17
Chicago, Ill	1.21	1.16	1.10	0.91	0.79	0.72	0.53	0.56	0.76	0.90	1.03	1.18
Milwaukee, Wis	1.29	1.27	1.22	1.04	0.82	0.75	0.56	0.62	0.84	0.97	1.09	1.25
Duluth, Minn	1.23	1.20	1.25	1.08	0.83	0.72	0.67	0.74	0.91	1.11	1.09	1.17
Upper Mississippi Valley:												
Saint Paul, Minn	1.17	1.14	1.18	1.09	0.70	0.74	0.56	0.66	[illegible]	1.05	1.04	1.14
La Crosse, Wis	1.20	1.10	1.18	0.97	0.78	0.71	0.69	0.61	0.80	1.08	1.06	1.19
Davenport, Iowa	1.20	1.12	1.13	0.89	0.78	0.66	0.52	0.54	0.74	0.93	1.04	1.23
Des Moines, Iowa	1.15	1.11	1.10	0.83	0.78	0.70	0.55	0.64	0.76	0.92	1.01	1.15
Dubuque, Iowa	1.21	1.11	1.17	0.92	0.77	0.70	0.55	0.67	0.79	0.96	1.07	1.23
Keokuk, Iowa	1.14	1.08	1.09	0.84	0.75	0.62	0.52	0.50	0.66	0.88	1.00	1.20
Cairo, Ill	1.11	1.09	0.94	[illegible]	0.63	0.52	0.42	0.42	0.53	0.68	0.89	1.14
Springfield, Ill	1.18	1.12	1.08	0.84	0.72	0.63	0.40	0.52	0.63	0.84	[illegible]	1.20
Saint Louis, Mo	1.09	[illegible]	1.03	0.87	0.70	0.58	[illegible]	0.47	0.58	0.78	0.96	1.20
Missouri Valley:												
Leavenworth, Kans	1.14	1.09	1.21	[illegible]	0.73	0.62	0.50	0.40	0.64	0.86	1.03	1.14
Omaha, Nebr	1.16	1.10	1.12	1.02	0.78	0.68	0.57	0.56	0.73	0.86	1.01	1.11
Bennett, Fort, Dak.[1]	1.14	1.12	1.05	1.02	0.88	0.72	0.67	0.71	0.74	0.91	1.02	1.19
Huron, Dak	1.20	1.16	1.16	1.06	0.84	0.70	0.65	0.71	0.91	0.95	1.09	1.17
Yankton, Dak	1.16	1.00	1.17	1.04	0.81	0.70	0.66	0.65	0.78	0.93	1.03	1.09
Extreme Northwest:												
Moorhead, Minn	1.25	1.14	1.13	0.95	0.83	0.68	0.68	0.78	0.84	1.03	[illegible]	1.17
Saint Vincent, Minn	1.24	1.30	1.26	1.03	0.80	0.68	0.77	0.83	0.94	1.06	1.10	1.19
Bismarck, Dak	1.23	1.14	1.13	1.01	0.82	0.72	0.67	0.71	0.84	0.94	0.90	1.16
Buford, Fort, Dak	1.23	1.16	1.07	0.90	0.75	0.73	0.70	0.67	0.88	0.87	1.04	1.10
Totten, Fort, Dak	1.10	1.00	1.01	0.80	0.69	0.70	0.58	0.70	0.87	0.82	0.76	1.08
Northern Slope:												
Assinaboine, Fort, Mont	1.08	1.07	0.89	0.96	0.66	0.52	0.54	0.60	0.77	0.86	0.97	1.16
Benton, Fort, Mont	1.17	1.14	0.96	1.00	0.62	0.63	0.56	0.61	0.78	0.83	0.96	1.14
Custer, Fort, Mont	0.84	0.86	0.70	0.70	0.57	0.53	0.56	0.60	0.74	0.85	0.90	1.06
Helena, Mont	0.89	0.80	0.64	0.82	0.62	0.64	0.50	0.53	0.72	0.75	0.82	1.01
Maginnis, Fort, Mont	0.79	0.86	0.74	0.61	0.64	0.57	0.40	0.50	0.64	0.76	0.68	0.92
Poplar River, Mont	1.20	1.03	0.92	0.98	0.76	0.76	0.68	0.53	0.80	0.70	0.78	0.98
Shaw, Fort, Mont	0.96	0.90	0.78	0.80	0.66	0.58	0.57	0.56	0.72	0.70	0.69	1.06
Deadwood, Dak	0.86	0.81	0.84	0.83	0.66	0.61	0.53	0.53	0.66	0.75	0.77	0.84
Cheyenne, Wyo	0.73	0.74	0.74	0.83	0.63	0.54	0.43	0.43	0.61	0.67	0.76	0.88
North Platte, Nebr	0.99	0.90	0.95	1.01	[illegible]	0.63	0.68	0.59	0.73	0.83	[illegible]	0.97
Middle Slope:												
Denver, Colo	0.80	0.97	0.80	0.89	[illegible]	0.56	0.45	0.45	0.66	0.73	0.80	0.93
Pike's Peak, Colo	0.74	0.75	0.70	0.74	0.56	0.51	0.30	0.35	0.64	0.62	0.84	0.81
West Las Animas, Colo	0.78	0.97	0.87	1.02	0.77	0.59	0.40	0.50	0.68	0.79	0.87	0.93
Dodge City, Kans	1.06	1.00	1.10	1.09	0.78	0.63	0.51	0.51	0.73	0.81	1.02	0.96
Elliott, Fort, Tex	0.83	0.82	0.78	0.84	0.62	0.46	0.38	0.30	0.53	0.66	0.84	0.97
Southern Slope:												
Sill, Fort, Ind. T	1.00	0.93	0.84	0.82	0.66	0.53	0.38	0.36	0.54	0.65	0.94	1.06
Concho, Fort, Tex.[2]	0.77	0.81	0.74	0.77	0.58	0.44	0.33	0.32	0.48	0.58	0.77	0.89
Davis, Fort, Tex	0.58	0.55	0.54	0.53	0.43	0.29	0.23	0.24	0.34	0.48	0.56	0.61
Stockton, Fort, Tex	0.75	0.73	0.64	0.66	0.51	0.30	0.29	0.29	0.42	0.53	0.70	0.64
Southern Plateau:												
Santa Fé, N. Mex	0.63	0.79	0.50	0.60	0.48	0.30	0.28	0.30	0.42	0.47	0.65	0.77
El Paso, Tex	0.64	0.64	0.51	0.56	0.50	0.34	0.34	0.33	0.45	0.52	0.70	0.16

[1] Station closed November 20, 1883.
[2] Station closed September 15, 1886.

Mean range of atmospheric pressure at stations of the Signal Service, &c.—**Continued.**

Districts and stations.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Southern Plateau—Con'd:	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*
Apache, Fort, Ariz	0.54	0.63	0.52	0.46	0.34	0.30	0.24	0.23	0.35	0.44	0.57	0.61
Grant, Fort, Ariz	0.50	0.51	0.40	0.40	0.30	0.26	0.21	0.22	0.28	0.36	0.51	0.54
Prescott, Ariz	0.59	0.68	0.53	0.53	0.38	0.33	0.28	0.27	0.38	0.45	0.57	0.62
Thomas, Fort, Ariz	0.64	0.60	0.48	0.51	0.37	0.35	0.47	0.47	0.39	0.49	0.56	0.68
Yuma, Ariz	0.78	0.67	0.49	0.51	0.37	0.35	0.33	0.34	0.40	0.51	0.54	0.63
Middle Plateau:												
Winnemucca, Nev	0.76	0.78	0.83	0.58	0.53	0.48	0.41	0.42	0.55	0.56	0.75	0.79
Salt Lake City, Utah	0.87	0.92	0.84	0.75	0.58	0.48	0.45	0.41	0.57	0.71	0.86	0.83
Northern Plateau:												
Boise City, Idaho[1]	1.00	0.96	0.90	0.76	0.70	0.56	0.52	0.53	0.63	0.72	0.93	0.98
Lewiston, Idaho[1]	1.10	1.13	0.95	0.76	0.77	0.54	0.56	0.54	0.72	0.86	0.96	1.20
Dayton, Wash.[2]	1.09	1.02	0.90	0.68	0.66	0.49	0.44	0.46	0.55	0.79	0.88	1.18
Spokane Falls, Wash	1.06	1.07	0.91	0.76	0.70	0.50	0.45	0.49	0.63	0.81	0.88	1.15
North Pacific Coast:												
Canby, Fort, Wash	0.98	0.98	0.83	0.68	0.50	0.48	0.43	0.41	0.56	1.17	0.88	1.12
Olympia, Wash	1.20	1.16	1.03	0.77	0.60	0.58	0.49	0.85	0.61	0.92	1.01	1.19
Tatoosh Island, Wash	1.02	1.14	0.83	0.69	0.56	0.50	0.44	0.46	0.64	0.93	0.93	1.29
Portland, Oreg	1.24	1.04	0.98	0.77	0.68	0.59	0.49	0.43	0.55	0.84	0.94	1.10
Roseburg, Oreg	1.16	0.95	0.92	0.75	0.61	0.53	0.45	0.38	0.53	0.72	0.87	0.96
Middle Pacific Coast:												
Cape Mendocino, Cal	0.77	0.98	0.86	0.73	0.46	0.46	0.36	0.31	0.30	0.57	0.76	0.81
Red Bluff, Cal	0.70	0.82	0.76	0.65	0.48	0.48	0.42	0.40	0.37	0.58	0.62	0.75
Sacramento, Cal	0.72	0.78	0.66	0.61	0.41	0.43	0.38	0.38	0.40	0.51	0.59	0.72
San Francisco, Cal	0.70	0.73	0.64	0.59	0.39	0.38	0.35	0.35	0.36	0.48	0.57	0.68
South Pacific Coast:												
Los Angeles, Cal	0.60	0.56	0.40	0.41	0.30	0.26	0.25	0.26	0.30	0.36	0.42	0.51
San Diego, Cal	0.59	0.40	0.38	0.36	0.29	0.25	0.20	0.25	0.30	0.32	0.38	0.47
Alaska Stations:												
Saint Michael's, Fort	1.79	1.52	1.23	1.35	1.04	0.81	0.79	0.84	......	......	......	......
Sitka	1.38	1.58	1.14	1.18	1.06	0.77	0.73	0.66	1.05	1.30	1.39	1.69
Unalaska	1.04	1.51	1.51	1.40	1.34	1.24	1.05	1.16	1.51	1.73	1.91	1.78
Behring's Island, Behring Sea	1.32	1.35	1.17	1.14	1.18	0.97	0.67	0.84	1.23	......	......	......

[1] Station closed December 31, 1885.

[2] Station closed November 30, 1886.

APPENDIX 30.

Mean maximum and mean minimum temperatures (in degrees Fahrenheit), at stations of the Signal Service, United States Army, for each month of the year.
(Computed from January, 1880, to December, 1886, inclusive, except at stations opened subsequent to the former date.)

[The monthly means are obtained by dividing the sum of the daily readings by the number of days in the month.]

APPENDIX 30.—*Mean maximum and mean minimum temperatures (in degrees Fahrenheit), at stations of the Signal Service, &c.*—Continued.

Stations.	January.																						December.	
	Max.	Min.																					Max.	Min.
	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
......	64.2	62.0	67.7	63.4	70.0	67.0	77.0	64.3	82.0	69.5	87.1	74.8	88.7	78.8	89.5	75.7	86.7	72.5	79.0	67.2	70.0	67.0	64.3	61.5
......	72.8	68.1	77.4	68.6	70.0	62.1	83.0	72.3	86.9	73.2	88.5	77.0	91.0	78.7	90.0	70.0	88.5	76.2	83.0	73.6	78.1	71.0	75.0	68.0
......	68.8	50.9	72.9	52.2	70.2	58.0	81.0	63.2	83.9	66.4	88.1	71.8	89.8	73.8	91.8	72.9	88.0	71.9	82.1	68.7	75.0	67.2	71.4	62.0
......	61.5	35.7	58.8	40.4	61.0	41.8	70.2	52.5	77.4	62.1	83.8	67.0	87.0	70.7	84.4	69.0	78.8	61.4	72.1	58.2	69.2	42.2	52.1	38.4
......	60.9	46.4	64.6	50.1	61.2	53.6	74.8	61.4	81.4	67.0	86.5	72.8	88.9	74.9	88.0	74.4	81.5	71.3	78.2	64.1	67.2	50.8	62.1	46.0
......	58.8	42.0	64.3	47.8	63.8	51.3	76.7	60.1	84.2	63.8	91.6	72.6	91.7	72.7	90.2	73.2	86.5	69.7	78.9	62.1	67.2	48.8	60.8	42.8
......	57.6	40.8	62.2	41.6	67.4	47.8	76.2	56.5	82.3	62.2	90.0	70.7	92.2	72.8	89.5	71.6	88.7	67.2	74.0	59.7	64.8	45.4	58.0	40.7
......	58.2	40.4	62.2	44.7	67.8	50.0	76.2	57.6	82.8	63.9	90.2	70.8	92.2	72.8	91.3	71.7	83.8	67.0	77.6	58.8	64.1	44.9	58.8	42.0
......	61.7	44.0	66.2	51.8	70.0	53.8	76.6	63.6	81.6	68.9	87.7	73.4	89.4	74.7	88.3	73.7	83.1	72.6	78.8	62.4	67.6	53.4	62.4	46.2
......	52.8	28.2	58.0	42.4	63.0	48.4	78.0	67.7	81.2	64.2	92.2	71.0	94.8	73.0	93.5	72.2	86.7	66.9	77.9	58.9	68.4	44.5	57.8	40.6
......	42.6	22.2	51.5	29.6	62.5	38.7	71.9	50.8	79.7	67.8	88.5	67.7	93.6	71.0	90.7	68.3	86.7	62.6	76.2	53.8	62.8	41.8	52.0	31.8
......	48.2	34.4	56.8	38.6	63.1	43.1	73.0	54.9	78.4	61.7	88.2	70.0	90.7	72.5	80.2	70.8	82.7	64.0	72.9	56.8	66.0	42.7	52.8	37.1
......	60.0	47.4	63.3	51.6	60.0	58.4	75.0	65.8	81.7	71.2	88.1	78.1	89.0	78.2	85.8	78.6	81.2	75.5	78.7	60.0	67.5	56.7	63.5	51.0
......	50.2	44.6	64.4	50.1	70.4	57.8	77.8	64.9	83.8	70.0	88.5	76.2	90.9	77.4	80.6	76.6	83.3	72.6	78.9	67.7	68.7	55.6	61.8	50.1
......	61.8	51.0	61.2	43.0	68.2	50.1	75.6	57.0	80.0	63.0	80.0	70.2	92.3	72.9	91.0	71.2	88.0	67.1	74.9	58.6	68.4	42.8	60.2	41.6
......	61.0	41.8	65.7	43.8	72.3	52.2	81.5	60.6	81.8	63.7	94.1	72.9	94.0	73.7	92.7	71.8	87.8	68.3	80.0	60.6	67.5	47.2	64.8	42.4
......	65.0	48.9	70.8	53.7	72.6	60.4	83.0	68.8	87.1	71.4	90.0	73.5	91.0	76.8	91.9	74.8	88.6	72.4	83.8	68.0	74.0	67.0	70.2	52.8
......	68.5	47.3	74.3	53.2	80.4	60.4	88.6	64.6	92.4	78.6	88.6	74.5	100.3	76.1	97.0	74.5	91.8	71.7	84.6	68.1	73.8	65.5	70.1	61.1
......	48.2	34.2	54.9	38.4	60.7	42.1	69.9	51.5	72.6	58.7	85.3	68.8	87.9	69.3	85.6	68.8	80.4	62.4	71.6	55.0	58.2	40.9	50.6	34.8
......	47.4	30.6	53.4	34.7	57.5	37.9	68.6	47.7	77.9	58.2	84.1	65.4	88.2	68.8	83.7	68.6	81.4	61.2	72.8	51.9	57.1	37.9	48.2	30.9
......	47.8	32.2	54.2	37.9	60.3	42.8	71.5	53.6	70.6	60.8	87.8	68.8	89.7	72.6	87.9	70.9	81.8	64.6	72.0	54.8	66.0	41.8	51.7	35.8
......	44.8	30.6	52.6	34.8	57.6	40.0	68.1	50.8	73.0	58.0	83.2	67.0	88.0	68.4	87.2	68.8	81.2	62.6	72.2	54.2	57.4	38.8	48.8	32.8
......	42.2	27.4	48.0	31.8	53.1	38.0	68.2	48.1	78.8	57.4	82.6	65.6	87.2	68.7	84.1	67.6	78.7	62.1	68.2	52.8	64.8	38.2	44.1	31.4
......	29.7	12.8	30.6	9.8	41.0	24.7	60.4	42.7	68.6	53.7	76.8	60.8	82.7	67.8	76.1	61.8	71.6	64.6	62.8	47.2	40.5	34.2	37.9	22.6
......	35.2	20.8	41.6	24.2	46.0	30.9	60.7	43.1	73.9	54.8	80.6	62.6	84.4	65.9	82.7	62.8	76.2	58.0	64.1	44.0	48.3	33.2	39.0	24.8
......	40.4	26.4	44.4	30.2	50.4	33.6	62.6	46.4	72.8	56.6	81.4	65.4	86.8	68.2	82.8	67.2	78.0	62.0	66.8	51.6	52.2	37.6	44.6	28.8
......	35.4	21.4	41.4	25.4	43.8	30.2	58.8	41.2	72.6	53.1	80.0	61.8	84.2	65.7	82.0	63.4	76.8	56.2	64.6	47.6	48.6	32.7	38.7	23.8
......	36.7	22.8	42.5	25.4	45.8	29.4	60.7	46.8	74.8	52.4	82.2	60.8	83.7	64.0	84.1	62.4	78.2	58.0	66.2	47.8	50.6	34.8	41.6	27.2
Buffalo, N. Y.	30.2	16.6	32.8	17.2	35.1	21.1	47.7	32.6	61.2	45.8	70.5	56.0	74.6	61.5	75.1	60.4	70.5	65.8	58.6	44.2	48.4	32.0	36.2	24.0
Oswego, N. Y.	32.1	18.6	34.2	17.7	36.5	22.1	40.2	34.7	64.6	46.6	73.0	55.4	72.0	61.9	70.8	60.6	71.6	53.7	67.0	46.0	46.1	32.0	36.1	22.2
Rochester, N. Y.	30.8	16.8	32.4	18.9	38.2	21.8	50.2	33.8	65.6	47.1	74.6	55.0	78.1	63.2	77.4	59.6	73.9	53.4	58.6	42.7	48.6	31.5	35.6	22.6
Erie, Pa.	32.6	19.6	37.1	20.6	39.2	24.7	51.6	36.4	63.6	48.4	73.6	58.0	77.6	63.6	76.8	62.4	72.0	57.8	61.6	47.1	47.2	34.7	36.4	26.0
Cleveland, Ohio	33.2	17.6	36.0	20.4	38.1	24.7	50.7	36.0	68.2	48.5	74.6	58.3	78.2	61.8	77.2	61.1	73.2	57.1	62.9	46.0	44.0	33.7	36.8	25.9
Sandusky, Ohio	33.1	19.2	37.6	22.1	40.6	27.2	52.8	36.8	66.1	52.5	76.4	61.0	80.7	65.8	72.4	64.8	73.7	58.5	61.6	46.6	47.1	34.2	37.4	25.9
Toledo, Ohio	32.4	18.8	37.6	22.3	42.6	27.4	54.8	36.6	68.2	51.3	76.0	60.6	81.8	61.7	78.4	62.4	73.7	57.6	61.8	46.8	47.6	34.0	37.8	24.0

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[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible], cont'd	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Dodge City, Kans.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Elliott, Fort, Tex.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[1] Station closed November [illegible], [illegible].

APPENDIX 30.—*Mean maximum and minimum temperatures (in degrees Fahrenheit), at stations of the Signal Service, &c.*—Continued.

Stations.	January.		February.		March.		April.		May.		June.		July.		August.		September.		October.		November.		December.	
	Max	Min.	Max	Min.	Max	Min.	Max	Min.	Max	Min.	Max	Min.	Max	Min.	Max	Min.	Max	Min.	Max	Min.	Max	Min.	Max	Min.
	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
Southern Slope:																								
Sill, Fort, Ind. T	46.1	26.4	52.6	30.8	62.8	39.6	75.9	50.2	80.1	58.6	89.8	67.1	92.5	69.9	92.2	68.8	84.4	61.8	74.3	50.1	57.6	35.6	52.6	31.2
Concho, Fort, Tex.[1]	56.0	31.7	61.6	36.8	72.0	44.4	80.6	50.3	86.0	59.1	91.6	69.6	96.6	70.6	94.3	68.6	86.3	62.8	77.3	55.5	62.9	40.0	58.4	35.1
Davis, Fort, Tex	55.3	29.1	61.9	34.6	67.4	40.1	75.0	45.7	82.8	52.9	91.9	62.1	89.0	63.8	85.6	60.9	80.2	55.4	74.8	48.0	63.0	37.5	58.9	32.0
Stockton, Fort, Tex	56.7	20.2	63.8	34.8	71.1	43.1	79.8	49.2	86.8	57.0	94.6	65.9	94.4	68.0	90.9	65.5	84.0	59.4	76.6	51.6	65.2	33.1	59.8	33.5
Stanton, Fort, N. Mex	36.8	13.6	55.4	26.2	60.9	31.3	67.4	37.3	71.2	41.6	79.9	47.0	78.3	54.3	70.8	53.6	77.0	46.9	70.3	31.9	59.2	30.9	53.2	23.5
Southern Plateau:																								
Santa Fé, N. Mex	38.3	14.7	43.8	20.2	51.4	27.1	55.7	34.5	68.6	42.7	79.8	52.3	81.0	57.2	77.7	55.6	72.0	48.2	61.8	37.6	47.2	25.7	42.1	20.4
El Paso, Tex	57.3	30.2	63.3	36.0	71.2	42.4	81.0	46.9	80.9	53.9	100.8	65.1	99.3	67.6	95.0	65.5	87.6	58.5	78.2	48.6	65.0	36.3	59.7	32.0
Apache, Fort, Ariz	50.1	19.4	54.0	23.5	60.4	29.5	69.4	33.4	79.0	39.2	89.0	47.0	90.7	57.2	85.9	56.5	82.2	46.5	72.5	37.5	60.9	25.0	54.1	23.2
Grant, Fort, Ariz	53.4	32.4	55.2	35.3	62.7	40.5	69.9	45.8	79.3	54.3	88.3	64.2	89.8	67.5	86.0	64.7	82.5	60.2	73.7	51.0	63.2	40.3	56.9	36.0
Prescott, Ariz	48.2	20.8	51.4	22.6	58.0	29.8	64.8	35.4	74.7	41.6	84.4	48.2	87.8	58.7	84.0	57.7	80.6	47.2	69.0	37.2	58.1	25.9	52.0	25.6
Thomas, Fort, Ariz	54.3	26.5	61.0	32.7	68.6	39.6	76.5	42.9	86.8	49.9	96.8	50.2	98.5	69.6	94.7	68.5	89.4	57.4	77.8	43.2	64.9	32.8	58.0	29.0
Yuma, Ariz	64.6	42.0	69.6	44.8	77.3	50.5	84.0	54.8	93.2	61.8	101.2	68.7	106.2	77.9	104.4	78.4	98.8	69.8	85.6	58.5	73.5	48.6	68.1	45.8
Middle Plateau:																								
Bidwell, Fort, Cal	46.9	21.7	56.0	29.2	58.1	31.4	61.4	37.2	72.9	33.8	77.2	44.0	88.5	46.2	93.0	48.0	74.6	35.2	68.9	30.9	52.2	29.2	43.4	24.6
Winnemucca, Nev	41.6	23.6	49.2	31.7	60.3	23.4	62.6	37.0	69.4	41.4	73.5	47.0	85.7	54.3	86.7	53.0	76.6	44.0	70.0	34.3	51.8	32.8	43.9	28.1
Salt Lake City, Utah	34.6	20.0	38.1	22.8	49.9	32.1	58.5	39.7	67.7	46.6	79.9	56.2	87.4	63.8	85.8	63.3	74.8	52.8	60.7	40.9	46.0	28.7	40.7	27.6
Bridger, Fort, Wyo	28.4	10.6	34.4	18.5	44.4	20.7	53.5	31.0	60.7	32.6	68.9	37.6	79.1	43.4	75.2	43.6	67.4	35.4	59.0	29.3	47.4	20.5	35.0	14.7
Northern Plateau:																								
Boise City, Idaho	38.2	19.2	41.3	24.1	54.0	32.2	61.5	39.0	70.7	46.0	80.6	52.0	88.3	57.4	86.6	56.3	74.0	46.3	60.8	38.0	48.4	29.6	41.2	25.0
Lewiston, Idaho[2]	36.2	24.4	38.7	25.3	55.3	35.1	64.0	40.8	72.2	47.5	79.4	55.1	87.2	59.5	86.7	57.6	74.0	49.2	60.1	40.7	48.7	33.3	39.6	27.8
Dayton, Wash.[3]	37.8	22.2	40.8	22.3	55.7	33.2	63.1	37.6	70.7	42.9	77.6	49.2	84.6	52.2	84.9	51.5	74.0	45.0	61.9	37.6	47.2	30.1	37.9	22.9
Spokane Falls, Wash	31.0	15.9	35.8	18.3	51.1	30.5	59.6	37.1	63.8	43.8	76.4	51.7	82.5	54.2	82.5	52.6	68.9	44.7	55.1	36.3	44.6	30.8	35.8	22.7
North Pacific Coast:																								
Canby, Fort, Wash	46.0	38.2	46.8	37.4	53.4	42.3	55.4	45.2	58.6	48.5	60.4	51.5	65.4	53.1	65.0	54.7	63.1	53.3	57.6	43.2	53.2	45.7	46.7	38.8
Olympia, Wash	43.7	33.4	44.9	32.5	53.3	36.2	58.7	39.9	65.5	42.8	70.6	48.2	74.6	49.8	73.3	51.1	66.0	47.5	57.8	42.5	49.4	33.6	45.4	35.2
Port Angeles, Wash	40.7	31.8	44.6	30.1	51.0	33.6	56.4	39.0	60.0	42.1	62.0	46.0	66.4	49.2	66.0	48.5	60.0	41.6	55.0	39.0	49.6	37.0	41.0	29.2
Tatoosh Island, Wash	44.7	38.8	44.3	37.6	49.8	41.6	53.9	44.8	56.4	47.6	50.4	50.2	63.4	52.4	63.4	52.0	59.1	51.0	54.9	46.6	50.9	44.2	45.5	38.6
Portland, Oreg	44.8	34.1	46.2	34.0	56.6	39.3	62.2	43.0	69.4	47.8	73.2	52.9	78.2	53.6	77.1	54.5	70.7	50.7	61.0	45.2	52.5	39.4	48.8	35.8
Roseburg, Oreg	46.9	35.0	48.8	34.7	58.2	37.2	61.8	41.1	68.8	44.7	72.8	50.2	79.7	52.2	79.4	51.6	74.8	47.3	62.3	42.7	52.2	38.0	48.9	37.0
Middle Pacific Coast:																								
Cape Mendocino, Cal	53.6	43.0	52.6	41.0	51.5	43.5	54.3	44.0	57.8	46.2	69.4	48.4	60.8	40.5	61.6	49.5	64.4	51.3	61.1	49.2	57.8	46.8	55.0	44.7
Red Bluff, Cal	54.7	36.8	58.0	39.2	66.5	43.8	69.5	47.9	79.4	55.0	86.6	60.3	93.4	65.9	93.9	64.0	86.5	59.1	73.5	49.5	61.9	42.0	55.4	39.9
Sacramento, Cal	52.8	38.4	57.2	40.6	64.4	45.9	67.3	49.2	76.0	54.1	81.2	57.0	87.6	59.9	88.2	58.6	83.8	56.1	72.8	49.1	62.2	42.1	54.4	41.4
San Francisco, Cal	54.4	45.7	56.4	46.2	59.4	48.4	60.5	50.0	64.1	52.0	64.8	53.4	65.7	54.5	64.5	53.9	66.6	51.4	64.2	53.2	60.2	50.4	56.7	48.2
South Pacific Coast:																								
Los Angeles, Cal	63.3	42.4	64.0	43.8	67.0	46.5	70.0	49.3	75.7	52.7	79.7	53.6	83.8	58.4	85.5	53.2	82.7	50.0	75.8	50.8	70.4	46.6	66.1	45.7
San Diego, Cal	61.0	44.2	61.9	45.4	63.1	48.8	65.8	51.7	68.5	56.0	71.4	58.8	73.8	62.0	75.7	63.6	73.8	60.2	69.3	54.7	66.9	48.8	64.8	47.6

Alaska Stations:																								
Alexander, Fort	23.4	14.1	16.3	0.6	30.1	17.3	37.2	24.0	49.5	33.8	54.2	43.5	60.0	43.8	61.7	47.4	53.3	40.0	43.5	30.9	30.6	17.8	19.4	6.1
Saint Michael's, Fort	17.6	5.0	6.0	−0.9	20.2	3.0	27.2	13.2	42.2	28.2	54.0	40.7	50.6	46.4	57.1	46.6	48.3	38.8	36.5	26.8	22.1	11.5	9.1	−3.8
Sitka	41.8	31.9	39.4	28.2	43.8	32.2	48.9	36.8	54.0	40.9	57.9	46.2	59.9	49.3	62.3	50.6	57.8	46.9	51.3	40.3	44.5	34.5	40.6	30.2
Unalaska	39.9	31.0	36.8	26.5	38.5	27.4	42.3	30.0	47.7	35.1	52.8	40.8	57.8	44.3	58.5	46.3	53.6	[illegible]	48.3	38.4	42.0	32.1	37.7	27.0
Behring's Island, Behring Sea	30.3	21.3	31.6	22.9	31.6	22.7	33.4	24.0	40.3	32.2	46.7	38.1	51.8	43.3	54.3	47.5	50.0	42.0	41.3	32.2	35.0	25.6	31.3	21.9

[1] Station closed September 15, 1885. [2] Station closed December 31, 1885. [3] Station closed November 30, 1885.

APPENDIX 31.

Mean monthly temperatures, and departure of 1885 therefrom (in degrees Fahrenheit), at stations of the Signal Service, United States Army. (Computed from the commencement of observations at each station, to December, 1885, inclusive.)

sum of the tri-daily observations by 3; the monthly, by ... n ... number of days in the month.
n at 7.35 a. m., 4.35 and 11.35 p. m., Washington time; ... 1, 1879, at 7.35 a. m., 4.35 and
79, to December 31, 1884, at 7 a. m., 3 and 11 p. m., Washi... December 31, 1885, at 7 a. m.,

Districts and stations.	January. Normal.	January. Departure, + or —.	February. Normal.	February. Departure, + or —.	March. Normal.	March. Departure, + or —.	April. Normal.	April. Departure, + or —.	May. Normal.	May. Departure, + or —.	June. Normal.	June. Departure, + or —.	July. Normal.	July. Departure, + or —.	August.	August.	September. Normal.	September. Departure, + or —.	October. Normal.	October. Departure, + or —.	November. Normal.	November. Departure, + or —.	December. Normal.	December. Departure, + or —.
New England:	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
Eastport, Me	19.0	+ 0.7	22.3	— 3.8	28.1	— 5.8	38.0	+ 1.8	47.3	+ 0.2	53.8	+ 0.8	60.5	+ 1.1	60.7	— 0.6	53.6	— 1.2	47.1	+ 0.8	35.7	+ 3.5	23.8	+ 2.5
Portland, Me	22.3	+ 1.0	23.0	— 5.6	32.8	— 4.9	42.0	+ 2.5	54.8	± 0.0	64.3	+ 1.0	69.4	— 1.8	67.7	— 3.6	60.6	— 3.0	50.2	— 2.7	38.1	+ 0.3	20.4	— 2.3
Mount Washington, N. H.	5.0	— 4.3	6.3	— 5.7	9.9	— 7.6	20.6	+ 2.2	33.6	+ 2.6	43.6	— 1.2	47.6	+ 0.7	47.1	— 3.5	40.5	— 3.2	30.2	— 0.3	16.8	+ 4.6	9.2	+ 0.9
Boston, Mass	26.3	+ 0.7	27.8	— 7.3	33.8	— 5.9	44.0	+ 2.3	56.0	— 3.7	66.2	+ 0.2	71.4	— 0.1	69.3	— 1.9	62.2	— 2.6	52.0	— 0.0	39.0	+ 4.2	30.2	+ 2.6
Block Island, R. I	30.4	+ 1.1	31.5	— 7.9	34.7	— 4.9	43.2	+ 1.4	51.7	— 1.0	62.5	+ 0.2	68.9	+ 1.7	68.5	+ 0.2	64.1	— 2.7	55.1	— 0.6	45.2	+ 1.9	36.2	+ 0.5
New Haven, Conn	27.5	— 0.7	29.1	— 0.4	34.5	— 7.9	45.6	+ 0.4	57.9	— 3.0	67.5	— 2.3	72.6	— 0.5	70.2	— 2.4	64.1	— 3.4	53.4	— 1.8	40.8	+ 1.6	31.3	+ 2.0
New London, Conn	28.5	+ 0.5	29.4	— 0.7	35.1	— 5.4	45.2	+ 1.8	56.2	— 1.7	65.7	— 0.3	71.2	+ 0.2	69.8	— 1.4	63.3	— 2.3	53.6	— 0.7	41.2	+ 3.5	32.1	+ 2.9
Middle Atlantic States:																								
Albany, N. Y	23.0	— 1.3	24.9	—10.2	32.1	— 9.0	45.2	+ 0.1	59.1	— 1.9	68.5	— 1.4	72.4	+ 0.0	70.0	— 3.4	63.1	— 3.1	51.2	— 0.9	39.1	+ 1.5	28.6	+ 1.6
New York City	29.8	— 0.6	31.1	— 8.0	36.4	— 6.7	47.1	+ 0.6	58.9	— 2.7	68.6	— 1.3	73.5	+ 0.7	72.1	— 1.8	65.5	— 1.4	55.5	— 1.0	42.8	+ 2.0	33.3	+ 2.7
Philadelphia, Pa	31.4	— 1.5	33.5	—10.1	39.1	— 8.8	49.8	+ 0.0	61.9	— 2.3	71.8	— 0.7	76.1	+ 1.1	73.7	— 1.9	66.7	— 1.5	54.2	— 1.4	43.4	+ 1.6	34.5	+ 2.2
Atlantic City, N. J	31.9	+ 0.4	33.4	— 7.7	37.9	— 6.5	46.4	+ 0.2	57.1	— 2.3	66.6	— 0.1	72.4	+ 1.0	72.0	+ 1.1	67.1	— 2.4	57.0	— 1.2	44.5	+ 1.9	35.8	+ 1.1
Barnegat City (¹), N. J	31.4	+ 1.9	32.0	— 5.6	37.6	— 5.2	45.8	+ 1.7	56.8	— 2.2	66.6	— 0.3	72.3	+ 1.4	71.7	+ 1.0	68.0	— 1.8	56.4	+ 0.3	44.2	+ 2.9	35.3	+ 2.7
Cape May (²), N. J	34.2	+ 2.2	35.3	— 5.7	39.7	— 5.4	43.2	+ 0.7	58.7	— 1.3	68.2	— 0.0	73.0	+ 0.5	73.2	+ 0.6	69.0	— 1.1	58.9	— 0.7	46.4	(²)	37.0	(²)
Sandy Hook, N. J	30.6	+ 0.4	31.7	— 6.5	36.8	— 6.3	46.2	+ 1.0	58.4	— 3.6	68.5	— 1.4	74.1	— 0.4	72.7	— 0.0	67.0	— 2.5	56.8	— 1.6	44.8	+ 1.4	33.2	+ 1.8
Baltimore, Md	34.4	— 3.4	36.9	— 8.4	41.9	— 6.6	53.0	+ 1.2	64.6	— 1.6	73.9	— 1.3	78.4	+ 1.2	75.3	— 0.7	68.0	— 1.1	57.7	— 3.3	45.2	+ 0.4	37.1	+ 0.6
Washington City	32.9	± 0.0	35.2	— 8.9	41.6	— 7.8	52.6	+ 0.5	64.2	— 1.9	73.5	— 2.4	77.8	± 0.0	74.7	— 1.3	67.8	— 1.7	57.7	— 3.0	44.1	+ 1.2	35.7	+ 1.8
Cape Henry, Va	40.6	+ 1.4	42.5	— 7.0	46.4	— 7.8	54.0	± 0.0	64.0	— 1.7	73.3	— 1.1	77.0	+ 0.5	76.8	+ 0.8	72.0	— 1.0	63.0	— 1.9	51.7	— 0.4	43.5	— 0.1
Chincoteague, Va	31.1	+ 2.6	37.7	— 6.2	40.8	— 4.6	49.6	+ 1.2	60.1	— 0.2	69.5	— 0.1	74.7	+ 1.7	73.4	+ 1.0	70.0	— 2.7	60.6	— 2.0	48.0	+ 0.7	39.2	+ 1.2
Lynchburg, Va	36.7	— 1.8	40.2	— 8.6	45.4	— 6.4	55.6	— 0.8	66.3	— 2.9	74.4	— 1.1	78.7	— 1.0	75.6	— 0.8	68.7	— 1.3	58.2	— 4.6	45.8	— 0.3	38.6	+ 0.8
Norfolk, Va	40.8	+ 1.9	43.0	— 5.8	47.7	— 6.9	56.9	+ 0.6	66.6	— 1.5	75.5	— 1.2	79.6	+ 0.0	77.1	+ 0.8	70.0	— 0.9	61.2	— 0.6	50.0	+ 1.4	42.5	+ 0.7
South Atlantic States:																								
Charlotte, N. C	41.8	— 0.7	45.8	— 7.3	50.3	— 5.0	58.9	+ 0.5	68.7	— 1.3	75.8	— 0.2	79.2	— 0.0	76.8	+ 0.0	71.0	— 1.1	62.7	— 6.5	49.6	— 0.5	43.0	— 0.3
Hatteras, N. C	44.1	+ 5.8	47.2	— 6.0	48.9	— 4.5	55.9	+ 2.4	66.1	+ 0.2	74.0	— 1.0	78.2	± 0.0	77.5	+ 0.5	74.6	— 2.5	66.9	— 2.8	55.9	— 1.3	47.4	+ 0.1
Kitty Hawk, N. C	42.4	+ 3.0	43.6	— 4.8	47.0	— 5.9	54.1	+ 0.2	63.9	— 0.3	73.1	— 0.7	78.7	+ 1.0	76.8	+ 1.0	72.8	— 1.0	63.0	— 1.8	53.0	— 1.0	45.1	+ 0.3
Macon, Fort, N. C	44.9	+ 1.7	48.1	— 6.6	50.1	— 4.8	57.4	+ 1.5	67.9	— 0.1	74.9	— 0.6	79.0	+ 0.6	77.0	+ 0.9	78.5	— 3.0	66.7	— 3.2	56.3	— 0.8	48.1	— 1.1
Smithville, N. C	46.9	— 0.3	49.4	— 6.9	53.6	— 7.7	60.5	— 1.5	69.5	— 0.3	76.8	— 0.4	81.0	— 0.4	79.8	+ 0.2	74.5	— 0.6	65.7	— 5.6	54.8	— 0.8	48.1	— 1.6
Wilmington, N. C	47.0	+ 2.2	49.6	— 4.5	51.4	— 5.1	61.6	+ 0.2	69.7	+ 0.4	76.6	— 0.2	80.5	+ 0.2	78.5	+ 1.2	73.4	— 0.8	64.1	— 1.7	54.3	+ 1.0	47.9	+ 1.6
Charleston, S. C	49.4	+ 1.8	52.7	— 6.2	57.5	— 5.3	64.4	— 0.6	72.7	± 0.0	70.6	± 0.0	82.6	— 0.0	80.7	— 0.1	76.1	+ 0.3	67.1	— 1.9	57.3	+ 1.8	51.1	— 0.7

	47.8	-1.0	50.0	-7.0	53.8	-6.2	66.0	-0.6	72.4	-2.6	78.7	-0.8	82.0	-1.0	79.0	-0.4	74.0	-1.0	64.5	-4.7	53.7	-1.2	47.7	-2.7
	51.0	-0.1	54.2	-4.0	60.2	-5.0	68.8	-0.6	73.0	-0.2	80.0	-0.9	82.0	-0.4	80.6	+0.6	75.0	+0.2	66.0	-2.4	57.0	+0.1	52.0	-1.9
	55.0	+0.3	58.2	-2.9	62.6	-6.0	68.9	-1.1	75.2	-1.0	80.0	-0.4	83.7	-0.3	80.0	-0.2	77.0	+0.6	70.0	-2.4	61.6	-1.8	55.0	-2.6
	57.9	-1.4	61.1	-2.2	66.0	-4.2	70.6	-1.0	75.0	-0.0	80.6	+0.0	82.6	-0.6	81.8	+0.2	78.0	+0.0	72.2	-4.4	63.2	-2.7	58.7	-0.9
	70.2	+1.0	71.7	-3.0	72.5	-2.7	76.0	-0.8	80.0	+0.4	83.2	-0.6	84.1	+0.8	84.2	+0.9	82.0	+1.1	76.9	-1.1	74.6	-2.0	70.0	-3.9
	58.9	+2.2	61.0	-2.4	65.2	-3.2	70.8	+0.2	73.6	-1.1	76.0	-0.2	81.6	-1.0	80.2	-0.8	78.1	+0.4	73.4	-2.0	65.0	-2.0	61.2	-5.0
	42.8	-2.0	47.0	-8.1	52.7	-5.7	66.0	+0.2	68.0	-2.7	73.3	+0.0	78.7	-0.5	76.0	+0.9	71.0	-1.8	60.1	-6.0	51.0	-1.1	46.0	-2.9
	50.2	-2.8	57.1	-6.6	60.0	-5.9	67.0	-0.6	73.0	-1.0	79.0	+0.0	81.1	+0.5	80.4	+0.4	77.4	+0.9	70.7	-6.0	60.1	-1.9	54.7	-4.3
	50.4	-2.7	54.0	-6.3	60.7	-6.2	67.0	-0.6	74.3	-2.0	80.6	-1.3	81.0	-2.2	80.6	-1.6	76.0	-0.2	67.9	-5.6	57.9	-1.7	51.0	-2.6
	46.7	-2.8	52.5	-7.1	57.5	-5.0	64.7	+1.1	72.1	-2.0	78.6	+0.4	82.3	-2.0	80.1	-0.4	74.5	-0.3	65.6	-4.9	54.8	-0.8	48.0	-2.4
	47.0	-2.1	52.0	-5.0	58.6	-4.4	67.2	+1.0	72.2	-2.1	80.0	+0.0	81.0	-1.1	80.4	-0.6	74.5	-1.1	66.1	-4.9	55.1	+1.0	50.2	-1.0
	54.0	-1.9	58.1	-5.0	62.0	-4.4	68.2	+1.7	75.0	-1.1	81.1	+1.1	82.0	+0.1	81.0	-1.5	78.0	-0.6	70.6	-4.7	60.0	-1.2	55.2	-2.1
	46.0	-4.1	51.1	-8.1	56.6	-4.2	66.0	+2.2	72.4	-2.2	80.0	+0.6	82.1	-0.4	82.0	-0.2	74.0	+0.2	66.0	-5.1	54.4	+1.0	49.2	-0.6
	38.1	+0.2	50.2	-3.6	60.7	-1.0	66.2	+1.0	67.2	-1.6	76.4	-0.0	76.7	+0.8	76.6	+0.4	72.2	-1.0	62.7	-5.5	51.2	±0.0	40.6	+0.9
	41.6	-4.1	47.0	-5.4	53.6	-2.0	62.9	+1.1	68.7	-1.6	73.0	+0.0	80.0	+1.9	78.3	+1.0	72.6	+1.1	64.7	-4.7	51.0	+0.4	44.0	-1.0
	52.6	-1.9	57.0	-4.4	63.0	-2.0	68.0	+2.4	76.4	-0.2	82.0	+1.2	84.0	+0.4	82.6	+0.0	78.0	+0.3	72.6	-2.0	62.1	+2.8	54.0	+1.1
	52.6	-3.1	57.3	-3.6	64.7	-4.2	68.0	+1.0	76.1	-1.1	82.0	+0.2	86.0	-0.6	82.7	+0.1	78.3	+0.2	72.0	-3.0	62.2	+2.2	56.0	+2.7
	42.0	-0.1	51.0	-4.2	58.2	-4.0	66.0	+1.4	70.2	-0.0	76.0	-0.1	81.0	(³)	78.0	+0.0	74.0	-0.6	67.0	-4.0	57.0	+0.0	48.0	+0.7
	51.8	(³)	55.7	(³)	62.3	-6.4	70.1	-1.8	75.3	-4.0	81.0	-2.0	82.0	-2.5	82.1	-0.6	77.8	-0.6	70.0	-3.0	60.0	+2.1	53.0	+1.0
	57.7	-3.2	61.6	-4.7	68.7	-2.0	74.4	+0.2	78.0	-2.2	82.0	-1.3	84.1	-1.3	82.0	-1.0	79.0	-0.8	73.2	-3.2	63.7	+2.1	60.0	+2.0
	56.7	-3.2	62.5	-6.8	70.0	-3.2	75.8	+1.1	80.5	-1.9	83.4	+0.3	86.7	-1.3	83.5	+1.7	81.6	±0.0	73.0	-1.0	64.7	+2.7	60.7	+2.3
	41.0	-2.4	45.6	-7.0	51.0	-5.6	60.0	+0.0	68.1	-2.5	73.1	+0.2	78.1	-0.3	73.5	+0.6	70.3	-0.8	62.0	-6.9	48.4	-1.0	42.2	-2.4
	37.4	-2.6	41.2	-7.6	47.5	-5.3	57.2	+0.3	66.4	-2.0	72.6	+0.7	76.5	+0.1	74.7	+0.1	68.3	+0.4	58.1	-4.8	44.0	+0.7	38.1	+0.5
	40.4	-2.0	44.0	-5.5	51.5	-3.9	61.2	+2.2	70.0	-2.2	72.2	+1.1	81.2	+0.6	78.1	+0.4	71.5	+1.2	61.0	-2.6	46.0	+2.6	42.4	+0.7
	38.5	-3.4	42.0	-8.5	48.2	-7.4	56.6	-0.7	66.4	-4.1	70.0	-1.5	80.0	-1.6	78.1	-0.3	70.0	-0.3	60.0	-4.8	47.2	+0.7	41.0	-0.7
	34.4	-3.0	38.0	-8.7	44.2	-4.6	55.0	+2.1	66.0	-1.7	74.7	-1.1	73.6	+0.0	70.5	-0.7	66.0	-0.6	54.4	-2.6	46.0	+2.6	37.0	+2.1
	30.0	-6.2	32.2	-12.3	38.0	-6.0	52.4	-0.9	62.9	-2.4	72.4	-2.0	76.4	-0.1	72.0	-2.9	65.7	-1.0	55.1	-4.7	40.0	+1.1	32.0	-0.5
Cincinnati, Ohio	33.4	-7.2	37.1	-12.0	42.0	-8.8	54.4	-1.9	65.2	-2.8	72.0	-4.2	78.2	-1.0	73.5	-2.2	66.1	-2.4	57.6	-3.2	44.4	-0.0	36.0	-1.0
Columbus, Ohio	30.0	-6.1	32.2	-12.1	38.1	-6.2	50.0	-0.5	62.0	-2.1	70.7	-1.0	73.0	+0.7	72.2	-2.2	63.0	-2.1	55.0	-5.2	41.3	-0.4	32.3	+0.3
Pittsburg, Pa	30.8	-2.1	33.0	-8.0	38.0	-7.0	49.8	+0.2	62.0	+0.3	70.0	-2.1	74.3	+2.4	71.0	-0.8	64.0	-0.3	54.2	-2.0	40.0	+2.7	33.3	+2.6
Lower Lakes:																								
Buffalo, N. Y	24.0	-2.0	24.0	-10.8	30.0	-10.2	41.2	-1.2	52.0	-0.3	64.5	-2.0	69.0	-0.1	68.0	-4.2	62.0	-2.0	50.6	-1.0	37.6	+2.0	30.2	+0.8
Oswego, N. Y	23.0	-6.0	23.7	-12.0	31.1	-12.4	42.4	-4.0	54.5	-2.0	64.2	-4.6	68.0	-3.1	68.2	-6.0	62.2	-4.2	51.2	-3.5	38.7	+1.5	29.7	-0.8
Rochester, N. Y	22.0	-2.2	24.6	-10.7	30.0	-10.0	42.7	-1.2	53.4	-1.0	66.0	-2.7	70.6	-0.8	68.0	-3.1	61.0	-2.0	54.2	-2.5	38.7	+2.5	28.1	+1.2
Erie, Pa	27.2	-2.3	30.1	-9.0	33.0	-7.9	42.7	+0.0	57.5	-1.4	67.2	-2.7	72.0	-1.0	70.1	-4.7	63.0	-2.5	53.2	-2.5	40.5	+0.2	32.5	-1.1
Cleveland, Ohio	30.0	-3.1	27.7	-11.5	32.0	-9.0	45.0	-1.0	58.0	-2.4	67.8	-3.0	71.7	-0.1	70.0	-4.2	62.0	-2.1	53.0	-2.0	38.2	+1.6	30.0	+1.0
Sandusky, Ohio	27.0	-6.0	28.0	-11.8	33.0	-8.6	46.0	-2.0	60.7	-3.0	67.0	-0.8	73.8	+1.2	71.5	-4.0	65.2	-1.9	56.0	-4.0	41.5	+0.2	33.4	-0.8
Toledo, Ohio	20.0	-3.1	20.1	-11.6	30.4	-7.2	47.6	-1.4	58.0	-1.0	68.0	-1.5	74.0	+1.3	71.4	-4.5	64.0	-1.0	53.2	-3.0	38.6	+2.6	30.7	-0.8
Detroit, Mich	24.4	-1.4	20.0	-10.0	32.0	-6.4	44.7	+0.4	57.8	-1.0	67.2	-1.4	71.7	+3.0	70.0	-2.3	62.7	±0.0	51.0	-1.8	37.0	+4.2	28.0	+3.0
Upper Lakes:																								
Alpena, Mich	17.2	-3.4	12.0	-10.2	22.6	-10.2	38.1	-1.4	48.7	-2.2	60.4	-1.1	63.2	-0.6	64.0	-4.2	56.0	-1.6	48.2	-2.7	32.6	+3.1	22.0	+0.7
Escanaba, Mich	14.0	-7.1	10.0	-9.8	21.0	-7.0	33.6	-3.4	46.0	-1.7	60.6	-1.2	68.0	+1.0	61.7	-3.1	58.4	-1.1	41.0	-2.8	31.2	+2.4	20.5	+2.0
Grand Haven, Mich	24.2	-4.1	26.6	-10.4	30.7	-7.2	42.4	-0.7	55.2	-2.4	64.4	-4.0	69.2	-1.9	67.8	-7.0	60.7	-1.5	50.2	-4.2	37.4	+1.6	28.2	-0.7
Mackinaw City, Mich	14.0	-1.6	11.0	-4.3	17.0	-3.5	36.0	-1.1	45.0	-1.3	56.0	-2.1	62.0	+2.3	61.2	-1.0	57.2	-1.6	47.4	-2.5	30.1	+1.0	23.9	+1.2
Marquette, Mich	16.5	-2.9	12.8	(³)	22.2	-11.2	36.0	-2.0	40.1	-2.7	55.0	-3.0	63.1	-1.4	61.8	-6.8	56.0	-1.1	43.0	-4.0	31.4	+2.9	22.2	+1.3

[1] Station closed December 31, 1888.

[2] Station closed October 31, 1888.

[3] No record.

APPENDIX 31.—*Mean monthly temperatures, and departure of 1885 therefrom (in degrees Fahrenheit), at stations of the Signal Service, &c.*—Continued.

Districts and stations	January. Normal.	January. Departure, + or −.	February. Normal.	February. Departure, + or −.	March. Normal.	March. Departure, + or −.	April. Normal.	April. Departure, + or −.	May. Normal.	May. Departure, + or −.	June. Normal.	June. Departure, + or −.	July. Normal.	July. Departure, + or −.	August. Normal.	August. Departure, + or −.	September. Normal.	September. Departure, + or −.	October. Normal.	October. Departure, + or −.	November. Normal.	November. Departure, + or −.	December. Normal.	December. Departure, + or −.
	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
....	21.1	− 4.8	22.9	−12.3	28.8	− 9.0	40.7	− 1.4	54.0	− 2.0	62.9	− 1.0	68.4	+ 0.9	67.4	− 4.4	61.0	− 2.0	49.6	− 2.3	36.1	+ 2.0	27.0	+ 0.8
....	24.7	− 6.4	28.1	−11.8	34.0	− 4.8	45.7	− 0.4	56.6	− 2.8	65.5	− 0.1	72.2	+ 0.6	71.4	− 3.3	64.0	− 0.1	52.7	− 1.7	38.6	+ 2.3	28.9	+ 2.2
....	19.7	− 8.3	23.0	−13.5	30.2	− 5.7	41.8	− 1.5	53.2	− 3.5	62.9	− 2.7	68.5	− 0.4	66.4	− 5.3	60.0	− 0.9	48.6	− 2.2	35.1	+ 2.4	24.5	+ 1.8
....	16.6	−11.1	16.1	−11.2	24.0	− 6.4	38.0	− 1.2	48.7	− 1.7	58.3	− 1.0	66.4	− 0.8	63.5	− 4.7	56.1	− 2.2	44.5	− 3.1	29.3	+ 2.7	18.5	+ 2.7
....	12.6	− 6.4	18.1	− 8.9	28.4	− 1.4	44.6	+ 0.7	56.4	− 1.7	67.2	− 0.3	71.7	+ 0.6	69.4	− 4.4	56.8	+ 0.3	46.9	− 2.7	31.1	+ 2.2	18.6	+ 2.3
....	15.6	− 7.2	21.6	−10.1	31.3	− 3.3	46.6	− 0.9	60.3	− 2.5	68.7	− 1.7	73.2	+ 0.7	70.8	− 5.0	61.5	− 0.1	50.0	− 3.3	33.8	+ 4.2	22.7	+ 3.6
....	21.4	− 4.6	26.9	− 9.6	36.2	− 0.6	49.1	+ 0.3	61.3	− 2.5	70.8	− 2.1	75.0	+ 0.6	72.9	− 4.6	64.2	− 1.2	52.6	− 4.4	37.5	+ 0.8	27.3	− 1.7
....	18.9	− 7.4	24.1	− 8.5	35.0	− 1.3	49.3	− 0.3	60.9	− 1.8	69.5	− 0.5	73.8	+ 2.1	72.5	− 2.7	63.8	− 0.3	53.3	− 4.6	37.5	+ 1.7	24.2	+ 4.3
....	18.6	− 6.3	24.0	−10.7	32.1	− 2.6	47.3	− 0.0	60.7	− 4.0	68.4	− 1.7	74.2	− 0.4	71.6	− 5.2	62.6	− 0.9	51.2	− 4.4	35.4	+ 2.2	23.4	− 0.4
....	24.1	− 7.0	29.6	−12.1	37.7	− 3.0	51.2	− 1.5	62.2	− 2.6	72.3	− 2.3	77.5	+ 1.0	74.9	− 4.9	66.2	− 1.0	54.5	− 3.1	38.7	+ 1.9	28.6	+ 0.1
....	35.1	− 5.8	40.2	− 8.3	47.2	− 4.7	58.4	+ 1.3	67.8	− 2.2	75.4	− 0.9	78.5	+ 0.5	77.7	− 1.2	69.6	− 0.3	59.6	− 3.7	44.2	+ 2.5	33.3	+ 0.7
....	24.6	− 6.9	31.9	−11.0	38.4	− 2.6	52.6	− 1.1	63.4	− 2.0	71.4	− 0.4	76.5	+ 1.6	73.6	− 2.6	66.1	− 1.3	57.0	− 4.1	42.4	+ 3.2	32.3	+ 3.0
....	31.8	− 5.6	36.5	− 8.5	48.0	− 1.0	53.1	+ 1.3	63.9	− 1.0	74.5	− 1.0	78.8	+ 1.7	76.6	− 2.0	68.2	+ 0.2	57.7	− 1.9	43.1	+ 4.7	34.6	+ 4.4
....	25.6	− 6.6	31.6	−10.6	40.8	− 0.7	52.3	− 0.6	64.6	− 2.8	73.8	− 1.6	77.9	± 0.0	76.1	− 2.6	67.1	− 1.0	53.6	− 2.3	40.2	+ 3.3	30.4	+ 2.4
....	28.4	− 5.2	28.6	− 9.7	35.7	+ 0.4	49.8	+ 0.3	63.2	− 2.4	71.6	− 0.5	76.2	+ 0.8	74.1	− 4.2	63.7	+ 0.6	52.6	− 2.5	36.1	+ 3.3	24.0	+ 2.7
....	9.3	− 4.4	15.1	− 4.4	29.2	+ 2.6	42.6	+ 2.2	56.6	− 0.1	67.6	− 2.5	72.4	+ 2.3	70.6	− 4.8	60.1	− 0.1	48.1	− 1.1	30.6	+ 3.6	18.8	(*)
....	8.3	− 4.6	12.0	− 5.4	28.3	+ 1.7	44.2	+ 1.7	52.4	+ 1.7	66.1	− 0.4	69.0	+ 2.6	67.7	− 2.7	56.2	− 2.0	46.1	− 2.9	30.3	− 0.6	18.8	+ [illegible]
....	14.8	− 5.8	19.6	− 6.4	30.1	+ 3.1	45.2	+ 2.0	58.8	− 1.9	68.5	− 1.3	73.3	− 0.2	71.7	− 6.0	61.2	+ 1.1	48.9	− 2.1	32.3	+ 2.5	20.9	+ 0.8
....	− 2.3	+ 1.6	5.1	− 2.2	17.9	+ 4.6	36.4	+ 2.3	52.3	− 0.6	64.3	− 2.0	68.8	+ 1.2	65.6	− 4.8	55.6	+ 0.5	42.9	− 1.6	24.2	+ 2.4	10.8	+ 4.3
....	− 7.4	− 2.5	0.4	− 6.6	13.2	+ 1.9	34.1	+ 2.0	51.1	− 0.5	61.6	− 2.7	65.6	± 0.0	63.3	− 4.6	52.5	+ 0.6	39.7	+ 0.3	20.7	+ 6.6	5.7	+ 8.0
....	5.2	− 5.6	10.7	− 7.1	22.0	+ 3.7	40.3	+ 2.0	54.9	− 0.0	62.6	− 1.6	68.2	− 0.6	67.3	− 5.6	53.6	+ 1.2	42.3	− 0.3	26.6	+ 6.2	14.7	+ 9.0
....	5.6	− 5.6	3.6	− 4.6	22.3	+ 5.3	41.6	+ 2.5	53.0	+ 0.3	63.7	− 1.6	66.6	+ 0.9	66.6	− 4.1	54.2	+ 1.8	42.3	+ 0.3	26.2	+ 7.6	18.0	+12.6
....	18.6	+ 1.2	14.2	+ 2.5	30.6	+ 0.6	42.3	+ 2.6	52.7	+ 1.1	62.8	(*)	66.1	− 0.6	65.3	− 1.7	53.6	+ 3.4	41.5	+ 5.1	30.5	+ 9.6	18.6	+12.6
....	12.2	+ 0.6	18.6	+ 6.4	31.6	+10.7	43.1	+ 2.6	54.9	+ 2.1	63.2	− 0.6	66.1	− 2.3	66.1	− 3.4	58.2	+ 1.7	44.5	+ 3.6	28.6	+12.8	21.8	+14.6
....	16.6	− 2.2	22.9	+ 1.6	32.8	+ 6.8	44.4	+ 1.6	54.6	+ 6.6	64.6	− 1.7	70.6	± 0.0	66.6	− 2.3	57.6	+ 1.5	46.3	+ 2.4	37.6	+ 6.6	30.3	+12.3
....	18.2	+ 4.3	21.4	+ 6.6	34.8	+ 5.7	42.1	+ 2.6	51.6	− 0.3	66.4	− 2.6	66.3	− 1.6	66.7	− 2.6	58.6	− 0.5	47.5	+ 4.4	31.3	+ 7.9	22.2	+ 8.9
....	17.5	+ 0.3	18.4	+ 3.7	31.3	+ 4.9	38.6	+ 2.0	48.3	+ 1.5	58.3	− 2.1	61.6	+ 0.7	62.3	− 1.6	62.1	+ 1.0	41.1	+ 4.6	34.6	+ 6.2	22.6	+10.9
....	− 1.3	− 2.3	− 1.0	+ 2.6	27.4	− 1.4	41.0	+ 2.3	54.6	− 0.5	66.1	− 2.6	66.3	+ 1.3	66.3	− 2.6	54.4	± 0.0	42.0	− 0.7	28.4	+ 3.8	5.1	+14.4
....	17.3	± 0.0	20.6	+ 2.3	32.8	+ 4.3	44.4	+ 4.0	54.4	+ 2.0	59.7	+ 0.1	66.3	+ 0.3	66.6	− 1.4	52.0	+ 2.0	41.8	+ 3.0	38.6	+ 9.3	23.0	+12.3
....	21.0	− 2.0	22.7	− 1.0	31.8	+ 1.3	38.7	+ 1.0	49.3	− 0.4	62.1	− 2.7	64.3	+ 2.3	64.3	− 4.6	52.6	+ 1.1	42.6	+ 1.0	32.3	+ 7.3	22.0	+16.3
....	24.0	− 1.3	27.7	− 3.1	32.3	+ 0.4	38.5	+ 1.3	50.8	− 2.3	61.3	− 2.6	66.6	− 1.2	64.6	− 2.7	53.8	+ 0.3	46.7	+ 1.4	32.7	+ 3.3	27.3	+ 6.0
....	18.8	− 6.0	26.6	− 6.6	36.7	+ 0.6	47.4	+ 3.0	56.3	− 1.6	66.1	− 2.4	73.6	− 1.3	71.6	− 4.4	61.3	+ 0.4	46.8	− 1.3	34.6	+ 4.7	25.6	+ 7.1

Middle Slope.																								
Denver, Colo	27.7	+ 1.4	32.0	+ 0.4	39.7	− 1.2	46.0	− 0.3	56.2	− 3.5	66.6	− 2.8	72.0	− 1.7	70.2	− 2.2	61.1	+ 0.8	50.2	− 0.9	37.9	+ 5.0	30.6	+ 5.6
Pike's Peak, Colo	2.6	− 1.2	3.4	− 1.5	7.7	+ 1.6	12.8	+ 3.0	21.8	− 0.7	32.4	− 2.6	39.9	− 0.7	38.4	− 1.3	32.1	− 1.1	21.3	− 0.1	11.0	+ 2.8	6.3	+ 2.5
West Las Animas, Colo	20.1	− 3.7	27.1	+ 0.6	40.0	± 0.0	49.6	+ 3.6	57.2	+ 0.1	69.2	+ 1.0	75.1	+ 0.1	72.2	+ 0.3	65.0	− 1.1	51.8	− 2.2	38.2	+ 3.7	28.5	+ 4.8
Dodge City, Kans	25.9	− 7.5	32.6	− 6.8	42.0	− 1.1	52.9	+ 1.5	62.6	− 3.9	72.8	− 1.6	77.2	− 0.9	74.9	− 1.8	67.1	− 1.1	54.9	− 3.6	39.3	+ 5.9	31.1	+ 5.5
Elliott, Fort, Tex	31.0	− 3.8	34.9	− 2.7	45.6	− 0.3	55.6	+ 0.4	63.5	− 3.2	73.0	− 0.8	76.2	+ 1.0	74.1	+ 0.5	67.9	± 0.0	56.7	− 3.2	42.1	+ 5.3	34.7	+ 5.1
Southern Slope:																								
Sill, Fort, Ind. T	35.7	− 6.7	41.8	− 6.2	52.1	− 3.8	62.0	− 1.4	69.1	− 4.4	77.4	− 2.4	81.3	− 0.5	79.4	− 0.9	72.8	− 1.1	62.1	− 4.4	47.9	+ 4.1	38.1	+ 5.3
Concho, Fort, Tex.[3]	42.3	− 5.8	47.8	− 4.1	57.4	− 5.2	64.6	+ 0.1	72.1	− 4.5	80.0	+ 0.9	82.5	− 0.4	79.8	+ 1.9	73.3	([5])	65.1	([5])	51.2	([5])	45.5	([5])
Davis, Fort, Tex	43.2	− 2.4	48.3	− 0.4	54.3	− 2.5	60.7	+ 0.9	68.1	− 3.6	74.9	+ 0.2	75.5	− 2.2	71.7	+ 1.3	67.2	+ 0.9	60.9	− 1.0	50.6	+ 4.8	45.1	+ 3.5
Stockton, Fort, Tex	43.0	− 3.8	48.7	− 1.4	56.7	− 2.6	64.0	+ 1.4	71.7	− 3.1	79.0	± 0.0	80.6	− 0.7	78.0	+ 1.5	71.9	+ 0.5	63.4	− 0.5	50.6	([5])	45.5	([5])
Southern Plateau:																								
Santa Fé, N. Mex	27.8	− 3.8	32.1	+ 0.1	39.5	+ 0.7	45.5	+ 0.3	55.6	− 3.1	65.1	− 3.5	68.0	+ 0.1	66.0	+ 0.3	59.1	+ 0.6	49.5	+ 0.1	36.9	+ 3.1	30.5	+ 1.9
El Paso, Tex	44.5	− 2.8	50.3	− 0.4	56.7	− 0.1	63.1	+ 0.5	71.9	− 2.3	80.6	− 2.3	82.0	− 0.9	78.9	+ 0.8	72.5	+ 0.1	63.6	− 1.3	51.0	+ 2.8	46.8	+ 0.4
Apache, Fort, Ariz	33.6	− 1.1	38.5	+ 1.1	45.0	+ 2.1	50.3	+ 3.0	57.2	+ 1.5	66.6	− 1.7	72.4	+ 0.6	69.8	+ 0.7	63.4	+ 2.0	53.6	+ 2.7	41.7	+ 5.8	36.6	+ 3.0
Grant, Fort, Ariz	42.4	− 1.3	45.7	+ 0.1	52.0	+ 1.1	57.0	+ 0.2	66.5	− 0.9	75.6	− 4.0	77.8	− 0.1	74.7	+ 0.7	71.2	+ 1.2	62.1	+ 3.0	50.5	+ 3.6	45.4	+ 2.4
Prescott, Ariz	32.6	+ 0.2	37.2	+ 3.0	43.2	+ 2.8	49.2	+ 2.4	56.6	+ 2.4	66.3	− 2.8	72.7	+ 0.5	70.0	+ 0.8	63.2	+ 1.7	52.5	+ 2.4	41.5	+ 2.8	37.0	+ 1.8
Thomas, Fort, Ariz	40.0	− 0.3	46.6	− 0.6	53.8	+ 2.0	59.6	+ 1.0	68.5	+ 0.7	78.4	− 2.6	83.2	+ 0.1	80.4	+ 1.1	73.1	+ 2.0	59.0	+ 1.8	48.5	+ 2.7	43.2	− 0.4
Yuma, Ariz	53.7	([5])	58.8	([5])	64.8	+ 2.4	69.2	+ 1.5	77.1	+ 1.1	85.2	− 4.0	92.0	− 2.9	90.8	− 0.3	83.9	+ 0.8	72.3	+ 2.4	61.0	+ 2.3	55.9	+ 1.6
Middle Plateau:																								
Winnemucca, Nev	29.4	+ 3.1	33.8	+ 0.6	41.7	+ 3.3	47.4	+ 2.3	53.4	+ 1.0	63.4	− 3.6	71.8	− 0.8	70.8	+ 0.3	60.3	+ 1.4	47.3	+ 5.7	36.2	+ 5.9	32.0	+ 4.9
Salt Lake City, Utah	28.6	− 0.6	33.2	+ 2.9	42.0	+ 2.9	49.0	+ 3.3	57.2	− 0.9	67.4	− 3.6	75.4	+ 0.3	74.5	− 1.2	64.2	+ 0.6	52.1	+ 2.6	39.2	+ 4.7	32.0	+ 1.1
Northern Plateau:																								
Boisé City, Idaho	28.4	− 4.4	33.9	+ 4.5	43.6	+ 2.4	50.2	+ 2.5	57.1	+ 1.8	66.0	− 1.7	72.7	+ 1.2	72.1	− 0.6	60.0	− 1.8	48.3	+ 4.3	38.8	+ 7.0	32.0	+ 3.3
Lewiston, Idaho[4]	30.3	− 6.8	31.9	+ 7.5	44.0	+ 3.9	51.4	+ 2.9	58.9	+ 1.5	66.7	− 0.9	73.1	+ 1.8	72.0	+ 0.8	60.3	+ 2.8	49.3	+ 1.8	39.2	+ 6.1	32.5	+ 7.3
Dayton, Wash.[1]	30.1	− 4.1	31.3	+10.8	43.4	+ 5.2	49.2	+ 1.5	56.2	+ 1.1	62.8	− 1.1	67.7	+ 2.0	67.3	+ 2.8	58.5	+ 1.8	48.8	+ 3.2	38.6	+ 5.7	30.6	([5])
Spokane Falls, Wash	23.2	− 1.3	26.7	+ 9.9	40.1	+ 5.6	48.1	+ 2.7	56.0	+ 1.2	63.8	+ 0.1	68.6	+ 2.7	67.8	+ 2.2	56.5	+ 3.1	45.3	+ 2.7	36.9	+ 4.2	29.0	+ 5.8
North Pacific Coast:																								
Canby, Fort, Wash	42.2	− 0.5	42.0	+ 3.7	46.8	+ 2.7	49.7	− 0.8	53.0	− 0.4	55.5	+ 0.8	59.5	+ 0.9	59.2	− 1.4	57.9	+ 0.6	52.9	+ 2.2	49.2	+ 0.3	42.5	+ 4.2
Olympia, Wash	38.2	+ 1.8	39.3	+ 5.8	44.5	+ 2.6	48.2	+ 0.8	53.5	+ 2.0	58.8	+ 2.3	61.8	+ 3.1	61.9	− 1.0	55.9	+ 2.0	49.6	+ 2.0	44.0	+ 1.8	40.2	+ 2.8
Tatoosh Island, Wash	41.4	− 0.2	40.8	+ 4.1	45.1	+ 2.4	48.2	− 0.9	51.0	+ 0.2	53.8	+ 0.5	56.4	+ 0.5	56.0	− 0.5	54.4	+ 1.6	49.9	+ 1.5	47.0	+ 1.1	41.6	+ 4.5
Portland, Oreg	39.2	− 2.9	41.9	+ 5.3	47.4	+ 4.6	51.7	+ 1.4	56.4	+ 2.5	61.8	− 0.8	66.3	+ 1.7	65.3	+ 1.2	60.6	+ 1.0	53.0	+ 3.0	35.3	+ 2.0	40.9	+ 2.1
Roseburg, Oreg	40.5	+ 2.9	42.4	+ 5.6	47.7	+ 3.1	51.0	+ 2.0	55.9	+ 2.4	61.2	− 2.0	65.8	+ 1.5	65.2	+ 0.4	60.6	+ 1.7	51.2	+ 5.1	44.6	+ 3.4	41.6	+ 3.1
Middle Pacific Coast:																								
Cape Mendocino, Cal	47.6	+ 2.1	46.1	+ 3.1	49.1	+ 0.8	48.8	+ 2.0	51.2	+ 0.3	54.3	− 0.6	54.8	+ 1.9	54.6	− 1.0	57.3	+ 0.3	54.3	+ 3.2	51.7	+ 1.0	49.7	+ 1.3
Red Bluff, Cal	45.7	+ 1.8	49.0	+ 4.5	55.2	+ 5.8	59.2	+ 2.9	66.8	+ 3.0	75.8	− 4.2	82.2	− 1.5	80.8	+ 3.0	73.9	+ 0.9	62.2	+ 3.4	53.9	− 1.2	47.0	+ 2.3
Sacramento, Cal	46.1	+ 1.0	49.9	+ 4.1	55.0	+ 4.1	58.0	+ 2.6	63.6	+ 2.1	68.7	− 2.5	72.3	− 1.3	72.0	+ 1.0	69.2	+ 0.6	60.8	+ 3.5	52.4	+ 2.0	46.0	+ 2.3
San Francisco, Cal	50.6	± 0.0	51.9	+ 2.5	56.6	+ 3.0	54.5	+ 2.6	56.4	+ 0.8	56.9	− 1.5	58.4	+ 2.1	58.6	− 0.1	59.8	+ 0.9	59.2	+ 0.3	55.8	+ 1.5	51.8	+ 1.7
South Pacific Coast:																								
Los Angeles, Cal	52.6	+ 1.3	54.1	+ 2.5	56.1	+ 4.5	58.3	+ 3.6	62.0	+ 1.5	65.4	− 0.4	68.5	+ 1.5	69.9	+ 2.8	67.7	+ 1.8	62.8	+ 2.0	58.2	+ 1.3	55.1	+ 2.8
San Diego, Cal	53.8	+ 0.2	54.5	+ 0.9	56.0	+ 3.6	59.0	+ 4.0	61.2	+ 2.1	64.4	− 0.1	67.2	+ 0.4	69.0	+ 2.8	66.8	+ 1.2	62.8	+ 1.1	58.4	+ 1.2	55.6	+ 1.5
Alaska Stations:																								
Saint Michael's, Fort	8.2	+ 4.0	−2.3	−13.8	9.1	+ 0.2	19.8	+ 5.6	33.2	+ 2.9	46.6	+ 0.7	53.6	− 0.8	51.9	− 0.0	43.9	+ 0.3	30.5	+ 2.5	15.6	− 7.6	4.8	− 2.5
Sitka	36.7	− 0.8	33.8	+ 3.4	37.9	+ 2.8	42.6	− 0.5	47.2	+ 2.5	51.8	+ 2.5	54.3	+ 2.0	56.3	+ 2.0	52.1	+ 0.7	45.7	+ 2.2	39.8	+ 0.4	35.5	+ 1.3
Unalaska	33.5	+ 3.7	31.1	− 3.7	32.7	− 1.0	35.1	+ 1.5	40.0	+ 1.7	45.9	− 0.7	49.6	− 0.8	50.3	± 0.0	46.0	− 0.9	40.4	+ 1.1	34.6	+ 0.9	32.8	+ 1.1
Behring's Island, Behring Sea	26.1	+ 0.8	27.8	− 2.1	27.0	+ 0.4	29.0	− 1.3	35.7	− 0.6	42.1	− 0.2	47.1	− 0.9	51.0	− 2.7	40.8	− 1.2	37.2	− 2.4	30.3	− 0.4	27.3	− 0.4

[1] Station closed November 30, 1885. [2] Station closed October 31, 1885. [3] Station closed September 15, 1885. [4] Station closed December 31, 1885. [5] No record.

APPENDIX 32.

Mean daily range of temperature (in degrees Fahrenheit), at stations of the Signal Service, United States Army, for each month of the year 1885.

[The daily range is the difference between the highest and lowest temperatures, as recorded by self-registering thermometers; the mean daily is obtained by dividing the sum of the daily by the number of days in the month.]

Districts and stations.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
	°	°	°	°	°	°	°	°	°	°	°	°
New England:												
Eastport, Me	17.0	14.5	12.6	12.2	14.8	15.7	16.4	14.4	14.5	10.6	10.8	15.6
Portland, Me	17.2	18.9	18.5	16.8	17.1	19.0	16.5	14.5	18.3	14.0	11.0	15.0
Mount Washington, N. H	24.4	22.7	18.5	15.4	14.9	14.3	11.2	11.4	13.0	11.5	11.8	17.4
Boston, Mass	18.9	16.1	18.1	17.8	15.0	21.0	16.9	14.5	18.1	14.8	13.6	16.0
Block Island, R. I	17.4	13.8	14.1	14.6	11.0	18.2	12.7	10.5	11.5	10.6	9.1	12.6
New Haven, Conn	16.7	16.7	17.6	19.6	17.9	20.9	18.0	16.4	20.9	17.9	13.9	16.3
New London, Conn	15.6	15.6	15.4	17.6	14.9	17.0	15.1	13.5	17.3	16.1	12.6	14.1
Middle Atlantic States:												
Albany, N. Y	16.7	20.3	17.4	22.2	21.1	21.5	20.9	17.3	21.1	17.4	12.2	14.5
New York City	15.4	15.3	15.4	18.6	15.9	18.9	16.1	14.6	16.3	14.0	13.3	15.0
Philadelphia, Pa	15.9	(1)	15.5	20.5	17.8	19.5	19.3	16.7	18.4	15.7	13.9	15.1
Atlantic City, N. J	16.0	15.0	13.9	15.4	12.2	15.5	13.7	13.9	13.2	13.8	14.0	16.1
Barnegat City, N. J.[2]	16.4	15.7	15.7	16.2	12.7	15.8	12.2	13.2	12.4	13.4	11.2	14.6
Cape May, N. J.[3]	16.4	16.2	10.7	14.0	11.7	13.1	11.7	12.5	13.4	12.9	(4)	(4)
Sandy Hook, N. J	15.7	14.9	14.5	17.3	13.7	18.3	16.1	13.2	15.0	11.8	11.5	13.1
Baltimore, Md	15.2	18.7	14.2	18.6	15.4	18.0	17.0	15.7	16.3	16.3	13.2	15.0
Washington City	17.8	14.8	16.6	21.7	17.8	19.1	19.1	17.6	18.9	17.4	13.4	15.7
Cape Henry, Va	17.9	14.4	16.4	15.9	13.6	13.5	16.4	13.3	14.0	12.8	13.8	16.9
Chincoteague, Va	16.4	15.2	15.8	17.5	15.0	15.9	14.7	13.2	14.0	15.1	15.1	16.0
Lynchburg, Va	17.0	16.6	17.4	23.3	18.3	19.0	20.2	18.4	19.3	21.5	17.9	18.2
Norfolk, Va	16.1	15.1	16.0	18.3	14.7	17.4	18.0	14.2	14.7	14.4	14.4	17.8
South Atlantic States:												
Charlotte, N. C	17.0	16.7	18.7	21.5	18.5	17.1	17.0	16.4	16.3	17.2	19.6	20.6
Hatteras, N. C	15.5	14.4	14.2	14.1	10.3	10.7	10.9	9.3	9.6	10.4	12.6	13.8
Kitty Hawk, N. C	16.1	15.0	14.9	15.8	13.6	14.5	16.7	11.6	10.5	10.5	13.4	15.8
Macon, Fort, N. C	14.2	14.1	14.5	13.6	10.3	9.5	8.8	9.7	9.9	11.3	13.6	14.2
Smithville, N. C	14.2	14.6	15.5	15.8	14.6	14.0	12.7	13.0	12.0	16.1	16.3	15.0
Wilmington, N. C	19.0	17.4	18.8	18.7	16.4	16.0	15.7	15.0	15.2	17.4	19.5	20.4
Charleston, S. C	14.8	14.5	15.3	15.1	13.7	13.6	13.3	12.5	10.7	13.4	15.4	17.3
Augusta, Ga	19.6	20.8	22.9	26.1	22.5	22.5	21.7	21.6	17.7	21.8	25.1	25.6
Savannah, Ga	15.9	17.1	17.2	16.8	14.9	14.3	14.7	13.0	10.3	13.6	16.6	19.6
Jacksonville, Fla	14.5	16.6	16.2	17.3	16.5	14.7	16.0	14.4	12.6	14.4	17.8	18.5
Florida Peninsula:												
Cedar Keys, Fla	12.2	12.7	11.9	13.5	11.9	11.4	11.0	11.6	11.0	12.7	13.7	16.0
Key West, Fla	8.7	9.4	9.7	9.9	10.6	10.8	11.9	11.6	10.8	7.6	8.0	8.1
Sanford, Fla	16.1	20.1	20.8	20.9	18.5	17.4	19.2	18.3	16.8	15.2	19.2	19.4
Eastern Gulf States:												
Atlanta, Ga	16.9	17.8	18.1	19.0	15.8	14.8	15.4	14.9	12.6	15.9	18.0	17.5
Pensacola, Fla	15.2	16.6	15.7	12.9	18.8	14.6	14.0	13.8	11.0	16.1	16.7	17.3
Mobile, Ala	17.4	18.1	19.0	16.0	16.0	17.2	16.7	15.6	14.2	19.2	18.0	18.9
Montgomery, Ala	18.3	20.2	21.7	21.2	19.2	20.3	19.3	17.6	15.0	18.8	18.5	20.6
Vicksburg, Miss	16.5	19.5	20.4	19.0	18.7	21.1	20.1	18.7	16.8	19.6	20.1	20.3
New Orleans, La	13.5	15.0	14.5	11.4	11.9	12.3	13.8	14.6	13.1	15.4	15.4	16.6
Western Gulf States:												
Shreveport, La	16.3	20.9	20.8	21.1	20.8	22.1	21.2	21.0	17.8	20.9	21.4	19.7
Fort Smith, Ark	18.8	24.7	22.8	21.4	19.9	18.2	20.1	20.6	20.7	24.6	23.6	21.0
Little Rock, Ark	15.5	21.2	21.9	20.1	18.2	17.4	18.8	18.5	16.1	19.1	20.7	18.1
Galveston, Tex	13.3	14.4	12.3	9.9	10.8	9.8	10.6	9.6	8.9	11.4	11.3	12.4
Indianola, Tex	13.1	14.5	12.1	12.1	13.0	14.1	15.1	13.5	11.4	13.8	14.3	13.7
Palestine, Tex	16.5	21.0	19.6	18.6	18.4	18.6	(1)	18.5	16.8	20.6	18.7	19.3
San Antonio, Tex	(4)	(4)	18.9	18.9	17.5	20.3	18.5	22.1	19.4	24.2	24.8	22.6
Rio Grande Valley:												
Brownsville, Tex	16.7	17.8	13.5	14.8	15.3	16.4	15.0	16.1	15.1	17.1	19.5	20.2
Rio Grande City, Tex	17.3	17.4	15.7	20.0	17.1	20.2	22.8	23.0	17.2	17.6	21.8	20.9

[1] Record incomplete.
[2] Station closed December 31, 1885.
[3] Station closed October 31, 1885.
[4] No record.

Mean daily range of temperature (in degrees Fahrenheit), &c.—Continued.

Districts and stations.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
	°	°	°	°	°	°	°	°	°	°	°	°
Ohio Valley and Tennessee:												
Chattanooga, Tenn	16.1	19.6	19.0	19.0	18.8	18.3	17.6	15.9	14.9	16.5	17.8	19.7
Knoxville, Tenn	17.3	19.2	21.0	22.3	19.9	18.8	19.8	17.9	18.9	20.9	16.7	18.9
Memphis, Tenn	18.3	16.7	17.0	18.0	20.6	18.3	16.0	17.0	15.5	16.9	17.6	17.1
Nashville, Tenn	19.2	20.1	21.1	19.9	18.1	16.1	17.2	17.8	17.0	19.4	16.9	16.9
Louisville, Ky	16.0	18.4	16.5	20.3	19.8	21.0	22.4	18.8	17.1	16.4	14.1	16.1
Greencastle, Ind	16.8	20.8	17.1	17.8	16.9	16.2	15.9	16.3	15.0	15.0	13.9	14.9
Indianapolis, Ind	14.8	18.4	14.9	17.3	20.2	21.0	20.8	20.9	20.1	18.7	13.6	15.2
Cincinnati, Ohio	15.5	19.6	18.2	19.3	19.3	18.5	19.7	18.3	18.8	17.8	13.0	15.4
Columbus, Ohio	15.7	20.3	16.4	20.1	20.5	19.6	18.7	17.2	20.5	18.7	13.1	15.4
Pittsburg, Pa	17.1	19.3	17.1	21.9	20.0	24.1	22.0	19.6	22.1	18.7	12.4	14.7
Lower Lakes:												
Buffalo, N. Y	13.9	17.9	15.4	16.0	15.7	14.3	15.0	13.5	15.7	13.6	9.8	13.4
Oswego, N. Y	17.6	19.3	14.2	15.9	17.2	19.5	15.3	12.8	16.8	14.2	11.5	14.7
Rochester, N. Y	15.8	18.8	16.1	19.4	19.9	23.8	20.5	17.3	21.2	16.7	13.8	15.1
Erie, Pa	14.2	18.5	16.5	17.2	16.5	18.9	16.1	15.4	17.0	16.4	14.0	17.0
Cleveland, Ohio	15.6	18.9	16.0	17.1	16.6	18.0	16.4	15.1	17.1	15.6	11.2	13.7
Sandusky, Ohio	15.2	19.4	15.3	16.4	16.4	20.7	16.6	15.2	17.3	15.5	11.4	14.4
Toledo, Ohio	15.5	19.2	16.0	17.1	16.3	18.6	17.5	15.4	16.6	14.4	10.7	14.0
Detroit, Mich	16.6	20.6	16.4	17.3	16.9	19.4	19.1	14.8	15.9	14.4	10.6	13.3
Upper Lakes:												
Alpena, Mich	15.5	20.0	23.2	18.1	16.9	23.1	19.6	16.5	18.7	14.4	9.9	11.8
Escanaba, Mich	16.5	20.9	24.5	16.6	17.0	20.6	17.1	15.0	17.5	13.3	8.9	11.5
Grand Haven, Mich	12.7	16.9	16.7	14.4	17.2	16.7	16.7	13.5	14.8	15.3	12.6	10.9
Mackinaw City, Mich	15.6	19.7	24.5	17.6	17.0	20.0	19.1	13.6	14.8	11.8	7.8	10.5
Marquette, Mich	(1)	(1)	19.8	17.4	17.4	21.8	20.2	15.0	20.9	13.5	8.6	15.3
Port Huron, Mich	16.0	20.7	18.5	16.6	17.2	20.6	16.9	16.0	18.0	14.6	10.2	12.4
Chicago, Ill	17.3	18.0	15.3	15.2	14.5	16.4	15.3	11.9	12.3	12.1	11.9	14.2
Milwaukee, Wis	16.4	17.8	14.9	14.6	17.5	20.4	18.7	14.3	16.2	13.5	10.5	12.8
Duluth, Minn	20.6	21.0	19.1	18.6	17.5	18.0	17.5	14.7	17.0	14.1	8.3	15.6
Upper Mississippi Valley:												
Saint Paul, Minn	19.0	20.6	20.2	20.3	22.9	22.2	20.4	17.7	22.3	18.8	12.4	15.7
La Crosse, Wis	17.4	17.3	15.6	14.2	17.8	17.0	16.5	14.5	16.3	15.1	11.4	13.5
Davenport, Iowa	17.4	19.3	16.3	16.1	19.8	18.2	19.4	18.0	17.0	16.6	14.9	14.7
Des Moines, Iowa	17.3	16.7	18.0	18.8	23.2	20.8	21.8	19.4	17.4	18.1	15.7	15.0
Dubuque, Iowa	19.6	20.7	17.0	16.8	21.3	19.4	20.3	18.4	18.1	17.5	14.9	15.0
Keokuk, Iowa	17.2	18.1	16.7	16.7	19.4	17.5	18.6	20.1	17.2	18.8	18.1	16.8
Cairo, Ill	15.8	16.9	16.4	17.9	15.8	15.8	14.7	15.2	13.7	15.9	15.5	16.2
Springfield, Ill	16.6	19.6	16.7	17.2	17.9	17.8	18.0	17.2	16.2	17.2	17.6	16.9
Saint Louis, Mo	19.3	21.4	17.8	17.5	15.9	15.9	15.2	15.7	14.3	16.3	15.9	17.4
Missouri Valley:												
Lamar, Mo	......	......	[2]21.2	21.0	19.4	17.4	18.7	19.6	99.2	23.6	22.6	19.7
Leavenworth, Kans	20.2	19.6	21.2	17.8	19.8	18.6	20.0	20.4	19.5	21.7	19.8	16.9
Omaha, Nebr	18.4	(3)	19.3	17.8	19.1	19.3	18.9	17.3	17.1	19.6	16.0	16.7
Valentine, Nebr	......	......	......	......	......	......	......	......	[2]25.9	26.5	23.8	26.3
Bennett, Fort, Dak.[4]	24.0	20.9	23.7	26.6	24.9	23.1	24.0	21.6	24.6	30.7	17.9	(1)
Huron, Dak	20.3	21.5	22.0	25.3	25.2	22.6	23.0	20.1	24.3	28.0	15.7	19.4
Yankton, Dak	17.5	17.7	21.5	24.1	23.2	21.0	21.2	18.2	22.7	24.6	19.0	20.0
Extreme Northwest:												
Moorhead, Minn	21.5	21.7	21.0	20.1	23.3	23.0	22.0	24.7	28.2	26.0	12.5	20.5
Saint Vincent, Minn	26.3	21.7	23.1	20.2	22.1	23.0	20.2	24.3	27.7	22.0	12.8	21.9
Bismarck, Dak	20.3	20.6	18.2	20.8	23.6	23.1	21.7	22.3	26.9	25.5	14.7	21.2
Buford, Fort, Dak	24.4	21.2	19.2	24.9	28.6	26.0	25.4	24.8	30.5	28.4	16.0	19.2
Totten, Fort, Dak	20.9	17.9	18.2	19.6	23.9	23.6	21.0	22.2	26.4	22.2	11.4	22.7
Northern Slope:												
Assinaboine, Fort, Mont	19.5	19.0	23.0	24.6	29.0	......	26.2	27.3	28.4	29.4	26.7	22.7
Benton, Fort, Mont	25.0	22.1	25.5	27.5	30.2	28.1	29.1	30.3	29.8	30.9	28.0	22.9
Custer, Fort, Mont	20.5	22.1	26.4	28.4	32.8	28.1	32.4	31.7	30.0	36.8	29.3	24.7
Helena, Mont	17.3	15.7	18.6	18.8	22.2	21.8	24.7	26.8	24.3	25.7	17.0	15.5
Maginnis, Fort, Mont	18.8	17.8	21.0	22.6	26.1	23.9	24.4	24.3	27.0	26.8	21.0	16.6
Poplar River, Mont	23.7	21.9	19.2	26.0	30.6	27.5	28.8	26.6	34.5	32.4	(1)	22.7
Shaw, Fort, Mont	20.0	20.3	25.9	26.0	28.4	25.7	26.9	28.1	28.5	30.2	(3)	19.1
Deadwood, Dak	16.8	17.4	15.7	17.5	20.3	18.8	20.9	20.7	21.0	20.9	19.1	17.6
Cheyenne, Wyo	23.5	20.2	21.3	21.8	24.3	26.5	27.5	26.1	26.4	26.5	24.0	22.7
North Platte, Nebr	21.2	19.6	22.8	22.1	19.5	22.3	21.6	19.1	22.0	26.9	20.1	20.1
Middle Slope:												
Denver, Colo	23.0	23.4	26.6	23.0	22.5	27.2	27.0	26.3	26.4	27.4	26.8	24.5
Pike's Peak, Colo	11.7	11.1	10.6	10.4	9.8	11.6	13.0	11.2	12.0	9.9	10.2	11.6
West Las Animas, Colo	31.3	29.3	34.4	30.1	28.1	30.2	28.4	29.2	33.0	34.3	32.0	27.9
Concordia, Kans	......	......	......	......	[2]21.5	22.2	19.1	23.9	21.3	27.7	21.7	19.6

[1] No record.
[2] No prior record.
[3] Record incomplete.
[4] Station closed November 30, 1885.

Mean daily range of temperature (in degrees Fahrenheit), &c.—Continued.

Districts and stations.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
	°	°	°	°	°	°	°	°	°	°	°	°
Middle slope—Continued:												
Dodge City, Kans	18.8	22.9	27.0	25.0	21.8	21.7	21.6	20.7	21.9	25.6	22.4	19.6
Elliott, Fort, Tex	20.3	19.8	25.9	23.5	21.5	20.9	22.9	22.7	24.5	30.3	29.3	22.6
Southern Slope:												
Sill, Fort, Ind. T	18.0	21.4	22.3	23.0	20.3	21.8	25.8	26.7	23.6	26.1	26.2	21.0
Abilene, Tex	......	......	......	......	......	......	......	(1)	(2)	25.2	24.0	23.9
Concho, Fort (3), Tex	22.4	28.1	23.2	24.9	24.0	28.6	27.6	27.4	......	......	......	......
Davis, Fort, Tex	25.6	28.5	24.5	26.8	25.9	26.0	24.6	24.8	25.6	28.4	28.1	28.5
Stockton, Fort, Tex	25.4	30.7	24.1	29.4	20.4	29.3	27.4	27.1	27.3	29.9	34.2	(4)
Stanton, Fort, N. Mex	......	......	......	......	......	......	......	......	......	......	[1]28.3	29.7
Southern Plateau:												
Santa Fé, N. Mex	23.3	20.4	20.9	21.0	21.6	22.9	23.4	22.3	24.0	25.2	20.4	20.8
El Paso, Tex	26.9	30.6	27.5	31.4	32.7	34.3	32.0	37.9	27.8	29.4	28.2	29.2
Apache, Fort, Ariz	29.5	33.7	29.6	32.9	37.0	40.6	35.8	30.0	37.0	40.0	32.5	33.2
Grant, Fort, Ariz	20.8	24.8	22.3	24.4	25.5	23.7	23.0	20.7	21.5	23.0	19.2	20.6
Prescott, Ariz	24.0	29.4	28.2	26.5	30.7	33.2	29.4	25.6	33.5	35.3	27.8	27.5
Thomas, Fort, Ariz	27.2	34.0	29.0	33.8	36.1	37.2	31.2	28.4	35.8	39.9	31.3	32.1
Yuma, Ariz	22.0	28.6	26.7	26.5	31.7	30.2	28.9	25.4	29.8	29.4	25.0	20.1
Middle Plateau:												
Bidwell, Fort, Cal	......	......	......	......	(1)	(2)	43.3	(2)	41.3	40.3	14.5	15.0
Winnemucca, Nev	17.0	17.4	31.9	25.7	27.9	26.5	31.5	33.7	32.7	35.7	19.1	17.7
Frisco, Utah	......	......	......	......	(1)	(2)	18.0	19.4	18.6	17.9	15.1	16.2
Salt Lake City, Utah	14.5	11.6	18.1	17.6	21.1	22.1	26.4	26.4	26.6	26.0	19.1	14.4
Montrose, Colo	......	[1]21.5	27.7	22.4	27.0	29.2	30.4	29.9	31.8	32.9	27.2	23.2
Bridger, Fort, Wyo	......	......	......	......	......	......	......	[1]29.4	30.4	31.3	27.6	20.2
Northern Plateau:												
Boise City, Idaho	18.0	13.4	23.8	24.3	22.7	23.9	28.4	28.8	25.8	25.1	12.4	16.0
Lewiston (5), Idaho	14.7	14.0	25.2	28.6	23.0	22.7	26.9	31.1	24.3	25.2	13.7	12.3
Dayton (6), Wash	18.7	13.9	26.1	30.2	25.2	25.4	34.0	35.9	29.2	29.9	18.4	(7)
Spokane Falls, Wash	16.4	12.8	24.1	25.6	22.3	21.2	25.8	28.6	21.4	24.1	15.0	12.0
North Pacific Coast:												
Canby, Fort, Wash	7.4	7.3	10.0	9.5	9.3	8.4	9.8	8.8	8.6	9.6	7.5	6.1
Olympia, Wash	11.3	11.4	21.6	26.9	24.5	22.5	28.0	26.5	18.4	21.2	11.1	11.0
Port Angeles, Wash	......	[1]13.5	16.7	19.3	15.3	13.3	17.9	16.5	13.7	16.3	14.8	14.9
Tatoosh Island, Wash	6.7	6.6	7.3	9.2	7.0	9.2	12.5	13.5	8.6	8.2	6.9	7.0
Portland, Oreg	11.2	11.8	20.6	26.8	25.6	23.3	25.8	29.7	22.7	23.1	16.9	12.2
Roseburg, Oreg	14.3	13.3	25.8	27.5	24.3	21.3	29.9	30.6	29.1	28.0	15.1	11.5
Middle Pacific Coast:												
Cape Mendocino, Cal	8.7	8.2	9.9	10.2	11.1	11.6	12.6	11.6	11.6	13.4	10.0	9.7
Keeler, Cal	......	......	[1]23.7	23.8	24.6	25.8	27.1	24.6	24.9	23.1	17.8	16.9
Red Bluff, Cal	16.3	18.8	25.5	21.6	26.6	25.1	28.7	30.9	27.7	25.2	11.8	11.7
Sacramento, Cal	10.7	16.2	20.2	19.8	25.0	24.0	26.5	32.1	31.9	28.6	13.4	8.8
San Francisco, Cal	7.8	10.0	11.3	10.1	10.8	9.7	10.9	10.1	13.4	11.1	7.8	10.9
South Pacific Coast:												
Los Angeles, Cal	21.2	25.3	24.8	21.7	21.8	27.2	27.2	28.0	28.2	27.1	18.6	19.5
San Diego, Cal	17.2	18.2	16.6	14.5	11.8	12.6	11.9	12.0	13.4	14.2	15.4	17.4
San Luis Obispo, Cal	......	......	......	......	......	[1]23.5	23.1	26.2	28.7	24.8	17.3	18.8
Alaska Stations:												
Alexander, Fort	12.7	18.5	14.5	11.3	14.5	12.8	11.8	12.1	11.4	12.3	16.8	17.1
Saint Michael's, Fort	13.5	17.9	15.2	12.7	13.6	11.1	11.3	10.3	7.6	7.9	12.4	18.6
Sitka	10.0	9.1	11.1	11.1	13.5	14.3	11.5	12.1	10.5	10.3	9.3	10.7
Unalaska	7.6	10.9	10.2	12.3	13.1	11.6	11.5	11.7	9.9	9.2	9.4	8.1
Behring's Island, Behring Sea	9.2	10.6	7.6	9.6	7.1	8.7	8.7	7.5	7.3	9.5	10.0	8.2

[1] No prior record.
[2] Record incomplete.
[3] Station closed September 15, 1885.
[4] No record.
[5] Station closed December 31, 1885.
[6] Station closed November 30, 1885.

APPENDIX 33.

Monthly and annual mean temperature (in degrees Fahrenheit), from reports made by voluntary observers of the Signal Service, United States Army, for the year ending December 31, 1885.

[The daily mean is generally obtained by dividing the sum of the 7 a. m., 2, and twice the 9 p. m. (local time) observations by 4; the monthly, by dividing the sum of the daily by the number of days in the month.]

Station													
	°	°	°	°	°	°	°	°	°	°	°	°	°
Accotink, Va	35.4	29.8	37.3	56.1	65.2	74.6	80.7	76.1	69.4	[illegible]	47.1	38.6	56.4
Aiken, S. C	46.0	45.6	49.6	65.8	72.9	([1])	([1])	([1])	([1])	([1])	53.6	46.0	....
Albany, Oreg	39.4	47.9	53.1	51.4	60.3	60.9	68.4	67.0	62.8	[illegible]	47.5	44.6	55.0
Allison, Kans	14.3	22.5	37.8	53.6	58.8	71.0	76.6	71.3	67.7	49.6	40.8	32.3	49.7
Altoona, Pa	28.4	25.7	32.4	50.9	61.4	69.2	78.1	71.3	64.3	52.5	42.8	35.6	51.1
Amherst (agri. sta.) Mass	22.7	15.2	23.8	45.3	54.8	63.6	70.4	66.0	58.3	49.1	39.8	29.6	44.0
Amherst, Mass	23.5	16.9	25.8	47.0	56.6	64.3	70.8	66.4	57.5	[illegible]	41.0	30.4	45.8
Anna, Ill	25.9	28.0	40.7	58.5	64.2	76.5	79.0	75.8	69.2	54.6	47.8	41.2	[illegible]
Ann Arbor, Mich	16.6	10.8	21.7	42.6	55.2	([1])	69.0	73.0	([1])	([1])	([1])	([1])	....
Archer, Fla	61.1	57.1	58.7	68.6	74.0	77.8	75.2	79.1	78.6	68.9	59.1	55.4	[illegible]
Asheville, N. C	38.0	([1])	51.0	53.0	60.0	72.0	([1])	([1])	([1])	51.0	44.0	([1])	....
Ashwood, Tenn	34.0	35.5	45.0	60.8	64.0	76.6	77.0	79.0	70.0	54.0	46.5	39.5	56.8
Atchison, Kans	16.2	18.7	38.7	52.6	61.8	71.6	[illegible]	72.8	65.9	50.9	41.3	31.5	50.9
Athens, Ga	39.5	39.1	47.4	61.3	65.6	70.3	[illegible]	76.5	70.6	56.8	49.9	42.5	58.7
Auburn, N. Y	23.0	16.2	18.9	43.8	56.2	64.2	70.4	66.0	59.4	51.4	38.9	31.7	45.0
Austin, Tenn	34.9	33.0	43.2	60.2	63.8	72.9	78.2	([1])	([1])	56.9	49.4	40.0	....
Austin, Tex	45.0	48.9	59.2	70.8	([1])	83.8	83.6	84.8	80.0	66.2	[illegible]	53.9	....
Bainbridge Island, Wash	39.0	44.8	47.5	50.0	57.7	[illegible]	65.7	63.3	[illegible]	52.0	47.5	43.5	52.9
Bandon, Oreg	46.3	([1])	([1])	([1])	([1])	([1])	([1])	53.5	54.6	50.1	47.7	45.9	....
Beloit, Wis	9.1	8.6	26.3	43.8	55.6	65.8	73.3	65.1	[illegible]	([1])	([1])	([1])	....
Bird's Nest, Va	40.9	35.0	[illegible]	50.6	67.0	75.6	83.0	79.9	71.7	62.1	51.9	42.6	58.4
Birmingham, Ala	([1])	41.3	47.8	63.8	68.4	78.0	([1])	([1])	([1])	([1])	52.0	([1])	....
Blooming Grove, Pa	([1])	([1])	([1])	45.2	56.2	([1])	73.6	([1])	59.6	([1])	([1])	31.1	....
Blue Hill, Mass	([1])	16.5	22.3	44.3	51.2	63.4	69.6	64.6	57.1	[illegible]	40.8	29.7	....
Blue Lake, Cal	43.0	47.1	53.4	52.0	56.6	55.6	64.5	64.6	61.2	59.1	48.4	45.4	[illegible]
Boyne, Mich	([1])	([1])	([1])	37.6	49.3	61.0	66.9	([1])	59.1	([1])	[illegible]	([1])	....
Brattleborough, Vt	([1])	([1])	([1])	48.0	56.4	4.8	72.4	65.9	57.4	46.0	38.2	28.6	....
Bunker Hill, Ill	([1])	30.3	36.6	52.8	62.1	71.2	79.3	72.3	66.2	[illegible]	40.7	31.6	....
Burlington, Vt	20.8	12.2	19.3	41.9	52.6	66.1	71.6	68.4	59.4	48.8	[illegible]	23.8	44.3
Carson City, Nev	35.6	41.6	47.2	50.0	58.8	61.6	73.3	70.9	62.0	52.1	[illegible]	39.1	52.6
Carthage, Mo	25.9	31.8	46.2	61.0	64.8	79.4	80.0	[illegible]	([1])	54.9	48.8	38.4	....
Catawissa, Pa	30.8	18.8	28.5	55.5	60.0	65.8	73.0	67.0	62.6	55.8	41.2	30.2	49.1
Cedar Rapids, Iowa	7.4	7.0	23.1	45.2	55.6	67.6	73.9	66.2	58.3	45.0	35.6	22.1	42.7
Chambersburg, Pa	25.8	26.0	28.2	48.6	60.4	68.5	77.9	74.7	65.3	49.3	43.4	34.5	49.7
Chapel Hill, N. C	39.2	36.0	42.9	58.6	67.2	72.2	79.6	([1])	([1])	([1])	([1])	([1])	....
Charleston, Ill	([1])	18.6	([1])	54.3	60.1	67.9	77.0	71.1	64.0	50.6	41.0	30.0	....
Charlotte, Vt	16.8	8.0	19.5	([1])	58.5	64.2	70.9	65.0	59.0	47.2	36.2	24.5	....
Cincinnati, Ohio	27.3	24.7	36.6	55.8	65.9	74.0	([1])	([1])	[illegible]	54.6	45.1	38.5	....
Clay Centre, Kans	17.9	22.1	40.7	54.8	61.9	73.6	77.5	79.2	([1])	([1])	([1])	([1])	....
Cleburne, Tex	34.1	39.1	49.2	65.0	67.3	77.3	81.1	[illegible]	76.0	68.0	52.5	46.1	61.2
Cleveland, Ohio	22.0	17.1	25.6	45.7	57.6	65.7	72.9	66.0	61.3	50.5	41.6	32.7	46.6
College City, Cal	[illegible]	54.0	6.99	60.9	71.5	72.2	76.4	79.8	71.6	65.0	53.8	48.9	64.5
College Hill, Ohio	30.9	25.4	37.8	53.0	65.5	70.6	80.5	76.3	66.7	52.6	43.6	35.0	52.4
Collinsville, Ill	21.1	22.8	38.3	54.8	62.2	72.1	74.2	70.4	66.4	51.6	44.1	36.9	51.4
Conception, Mo	13.1	15.4	[illegible]	50.0	60.0	69.0	76.6	70.8	[illegible]	42.0	[illegible]	29.5	47.4
Contoocook, N. H	21.2	13.5	28.7	45.9	57.3	67.5	([1])	67.1	[illegible]	48.3	38.5	27.4	....
Cooperstown, N. Y	19.0	10.5	18.3	40.3	53.0	62.5	68.3	63.5	56.3	46.3	37.7	27.5	41.9
Cornish, Me	18.2	([1])	21.1	42.7	([1])	65.5	69.3	64.4	56.0	46.4	35.8	23.9	....
Cresco, Iowa	−0.3	4.1	21.4	42.6	54.2	[illegible]	72.2	63.1	57.8	42.5	33.4	20.2	39.5
Crete, Nebr	11.0	15.2	34.9	49.8	57.8	68.7	73.6	69.0	67.2	47.2	37.5	28.4	46.3
Cumberland, Md	29.0	26.0	32.7	50.4	60.1	69.2	74.3	70.4	63.2	51.0	42.5	35.4	50.4
Dale Enterprise, Va	34.0	23.9	32.0	55.2	64.6	75.3	79.9	77.0	71.1	56.0	45.5	39.5	54.5
Deerfield, Mass	20.8	15.2	23.6	45.0	54.9	65.7	70.5	([1])	61.7	49.5	38.8	28.3	....
Des Moines, Iowa	9.3	12.2	33.0	48.1	56.7	67.4	73.9	67.8	62.2	48.2	39.5	25.9	45.4
De Soto, Nebr	9.4	14.5	34.7	49.4	59.3	69.8	75.2	68.7	63.8	48.4	36.8	27.1	46.4
Distributing Reservoir, D. C	32.7	27.8	35.8	56.5	65.5	74.8	81.3	76.5	[illegible]	56.4	46.6	38.0	55.0

[1] No record.

Monthly and annual mean temperature (in degrees Fahrenheit), &c.—Continued.

	°	°	°	°	°	°	°	°	°	°	°	°	°
Dorset, Vt	10.9	11.6	18.8	41.1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	37.0	[illegible]	41.7
Dover, N. J.	[illegible]	[illegible]	23.7	46.0	53.6	[illegible]	71.7	[illegible]	[illegible]	47.1	[illegible]	[illegible]	47.9
Drifton, Pa	24.1	15.5	21.8	41.8	54.4	64.8	(¹)	66.1	59.1	44.7	37.6	[illegible]	....
Dudley, Mass	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	70.1	(¹)	62.0	54.5	[illegible]	[illegible]	..
Dyberry, Pa	21.9	12.6	19.5	40.8	53.7	61.2	[illegible]	63.7	[illegible]	46.0	37.8	27.7	[illegible]
Easton, Pa	30.8	21.7	25.0	(¹)	61.0	(¹)	[illegible]	72.7	67.8	[illegible]	[illegible]	(¹)	....
Embarrass, Wis	2.1	6.0	20.2	41.8	57.2	64.5	[illegible]	[illegible]	[illegible]	45.4	[illegible]	[illegible]	41.3
Emmittsburg, Md	[illegible]	22.7	32.6	(¹)	(¹)	69.7	[illegible]	(¹)	64.0	52.0	[illegible]	[illegible]	....
Emporia, Kans	18.2	22.9	41.2	54.2	62.1	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	..
Eola, Oreg	30.1	40.5	52.4	52.3	[illegible]	60.2	66.0	[illegible]	61.0	53.0	[illegible]	[illegible]	[illegible]
Factoryville, N. Y.	21.3	14.8	21.8	42.0	55.3	62.3	[illegible]	64.5	57.7	46.4	[illegible]	[illegible]	[illegible]
Fairbury, Nebr	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	[illegible]	[illegible]	(¹)	65.7	(¹)	[illegible]	....
Fall Brook, Cal	50.0	53.0	54.2	60.7	61.2	63.4	70.1	72.5	[illegible]	63.0	57.7	54.0	61.6
Fall River, Mass	27.4	(¹)	27.4	41.8	52.0	62.7	70.7	67.0	62.2	52.1	42.7	[illegible]	..
Fallsington, Pa	[illegible]	21.1	28.1	44.7	57.2	[illegible]	74.1	69.2	61.7	51.6	42.2	34.4	[illegible]
Fallston, Md	29.5	22.8	30.6	50.0	60.1	[illegible]	74.0	70.4	[illegible]	53.3	42.7	[illegible]	[illegible]
Forsyth, Ga	44.7	44.4	51.7	63.3	70.4	[illegible]	82.3	[illegible]	74.0	61.7	[illegible]	[illegible]	[illegible]
Fort Scott, Kans	34.4	[illegible]	43.0	57.1	[illegible]	(¹)	(¹)	(¹)	(¹)	[illegible]	[illegible]	[illegible]	...
Fort Wayne, Ind	22.1	19.0	31.0	[illegible]	60.5	[illegible]	73.0	[illegible]	62.4	51.8	[illegible]	[illegible]	[illegible]
Frankfort, Ky	29.2	26.9	[illegible]	53.9	[illegible]	72.1	78.2	73.3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Franklin, Pa	18.3	14.0	18.6	39.0	[illegible]	61.2	[illegible]	[illegible]	[illegible]	42.1	[illegible]	[illegible]	[illegible]
Fremont, Nebr	7.4	12.2	32.0	47.0	[illegible]	67.7	73.1	[illegible]	[illegible]	47.0	[illegible]	[illegible]	[illegible]
Gardiner, Me	10.2	14.5	20.8	42.0	51.9	62.1	67.3	[illegible]	55.7	47.0	[illegible]	[illegible]	42.6
Garrettsville, Ohio	20.5	18.7	[illegible]	42.8	55.4	62.0	[illegible]	[illegible]	[illegible]	46.4	[illegible]	[illegible]	44.0
Genoa, Nebr	0.1	16.1	32.6	48.7	[illegible]	[illegible]	73.2	[illegible]	[illegible]	46.0	37.1	[illegible]	[illegible]
Grampian Hills, Pa	17.0	12.7	20.1	41.2	57.0	[illegible]	72.1	[illegible]	[illegible]	44.4	[illegible]	[illegible]	42.0
Grand Coteau, La	51.1	62.4	58.6	71.5	74.7	81.0	82.7	82.0	77.2	63.7	[illegible]	54.4	67.7
Great Falls Reservoir, Md	31.8	27.0	33.0	53.6	62.8	72.5	78.4	74.4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Greensborough, Ala	[illegible]	44.9	51.1	63.7	69.3	70.0	78.0	(¹)	[illegible]	[illegible]	[illegible]	[illegible]	....
Green Springs, Ala	[illegible]	43.4	44.2	[illegible]	71.0	80.0	80.4	80.2	(¹)	(¹)	(¹)	(¹)	....
Guilford, Ind	(¹)	22.1	31.7	48.0	[illegible]	[illegible]	77.2	[illegible]	[illegible]	51.7	40.4	[illegible]	....
Guttenberg, Iowa	5.2	7.0	23.2	44.2	55.1	64.1	71.2	65.3	[illegible]	40.0	(¹)	18.3	....
Hartford, Conn	23.0	14.0	26.7	46.8	[illegible]	67.0	71.2	63.7	57.2	46.2	40.4	[illegible]	[illegible]
Helvetia, W. Va	30.7	23.7	32.0	47.2	[illegible]	63.7	69.5	67.2	[illegible]	47.5	[illegible]	34.4	[illegible]
Hiram, Ohio	18.2	13.2	22.1	43.3	54.7	64.3	72.1	66.1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Hudson, Mich	13.9	10.1	20.8	42.3	[illegible]	60.2	72.4	63.1	(¹)	45.0	(¹)	(¹)	..
Humboldt, Iowa	3.2	4.2	(¹)	43.5	[illegible]	67.8	72.0	[illegible]	[illegible]	42.7	[illegible]	[illegible]	...
Humphrey, N. Y	16.1	14.1	14.1	38.2	53.2	62.7	[illegible]	64.3	[illegible]	47.2	[illegible]	[illegible]	41.5
Hydesville, Cal	[illegible]	50.3	51.7	52.0	(¹)	[illegible]	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	...
Independence, Iowa	5.2	8.1	27.6	45.1	[illegible]	60.1	72.7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Independence, Kans	20.0	25.2	42.1	50.6	[illegible]	[illegible]	78.2	74.0	[illegible]	54.6	[illegible]	[illegible]	[illegible]
Independence, Mo	22.0	18.0	37.2	44.2	(¹)	69.0	74.7	[illegible]	[illegible]	50.0	(¹)	(¹)	....
Indianola, Iowa	8.8	10.2	32.2	47.0	[illegible]	(¹)	(¹)	62.0	61.7	40.3	(¹)	(¹)	...
Ithaca, N. Y.	21.6	17.3	21.4	41.8	55.4	64.8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	44.7
Jacksonborough, Ohio	21.1	15.4	30.7	50.4	61.0	70.7	78.7	71.4	[illegible]	50.7	41.1	31.1	[illegible]
Jeffersonville, Ind	30.0	24.4	[illegible]	55.0	64.3	70.3	78.2	[illegible]	[illegible]	[illegible]	46.1	[illegible]	[illegible]
Laconia, Ind	20.7	23.7	(¹)	(¹)	63.7	[illegible]	[illegible]	[illegible]	[illegible]	52.0	43.0	33.0	..
Lafayette, Ind	17.6	14.7	22.6	40.2	50.5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
La Grange, Ind	17.7	11.9	23.4	44.7	57.6	(¹)	(¹)	[illegible]	(¹)	(¹)	[illegible]	[illegible]	..
Lansing, Mich	15.0	10.5	[illegible]	44.0	53.7	63.2	72.4	[illegible]	[illegible]	45.4	[illegible]	27.1	[illegible]
Lawrence, Kans	18.7	[illegible]	[illegible]	(¹)	(¹)	72.0	77.1	(¹)	(¹)	51.9	(¹)	[illegible]	..
Lead Hill, Ark	[illegible]	32.2	43.6	62.3	67.1	80.2	82.7	78.4	70.0	[illegible]	[illegible]	[illegible]	57.7
Leicester, Mass	21.5	14.2	21.0	[illegible]	53.1	63.1	(¹)	[illegible]	[illegible]	42.6	(¹)	[illegible]	...
Le Roy, N. Y	[illegible]	15.1	[illegible]	41.5	57.4	64.5	71.2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	43.1
Liberty Hill, La	(¹)	(¹)	61.1	72.7	74.7	[illegible]	87.0	[illegible]	72.5	60.7	[illegible]	[illegible]	..
Limona, Fla	[illegible]	60.8	64.4	72.7	77.0	81.7	[illegible]	82.0	79.4	70.2	[illegible]	[illegible]	[illegible]
Lincolnton, N. C	[illegible]	[illegible]	46.7	[illegible]	64.2	[illegible]	74.1	76.0	[illegible]	52.3	45.5	[illegible]	[illegible]
Logan, Iowa	(¹)	15.3	32.6	[illegible]	61.7	[illegible]	[illegible]	[illegible]	[illegible]	(¹)	[illegible]	[illegible]	..
Logansport, Ind	[illegible]	16.1	20.0	51.2	61.4	71.1	77.0	70.4	[illegible]	51.3	[illegible]	31.6	[illegible]
Luling, La	(¹)	(¹)	(¹)	[illegible]	(¹)	(¹)	(¹)	(¹)	[illegible]	[illegible]	(¹)	60.2	...
Lunenburg, Vt	13.4	[illegible]	13.6	41.1	[illegible]	61.7	[illegible]	61.4	[illegible]	45.7	[illegible]	[illegible]	40.2
Madison, Nebr	[illegible]	13.1	32.2	47.4	[illegible]	67.6	[illegible]	[illegible]	(¹)	(¹)	[illegible]	[illegible]	...
Madison, Wis	[illegible]	8.2	[illegible]	42.0	[illegible]	(¹)	[illegible]	[illegible]	[illegible]	[illegible]	(¹)	[illegible]	....
Mahanoy Plane, Pa	(¹)	(¹)	[illegible]	[illegible]	61.2	70.0	[illegible]	78.2	[illegible]	52.1	[illegible]	[illegible]	..
Manatee, Fla	64.1	60.2	63.2	74.4	[illegible]	81.7	[illegible]	84.4	[illegible]	[illegible]	[illegible]	[illegible]	72.3
Manchester, Iowa	[illegible]	10.5	28.5	46.4	[illegible]	[illegible]	[illegible]	67.0	[illegible]	[illegible]	[illegible]	[illegible]	44.4
Manhattan (B), Kans	13.3	20.6	[illegible]	52.0	[illegible]	73.6	[illegible]	74.1	[illegible]	50.9	[illegible]	31.7	51.5
Manistique, Mich	[illegible]	8.0	[illegible]	33.2	48.2	[illegible]	64.2	[illegible]	[illegible]	42.7	[illegible]	25.7	[illegible]
Manitowoc, Wis	8.7	11.0	[illegible]	[illegible]	50.3	57.8	67.7	64.4	[illegible]	45.4	[illegible]	[illegible]	41.1
Marietta, Cal	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	[illegible]	[illegible]	67.5	61.2	54.5	[illegible]	..
Marion, Va	[illegible]	28.0	34.2	[illegible]	[illegible]	71.0	[illegible]	[illegible]	[illegible]	50.0	42.7	33.0	51.1
Marquette, Nebr	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	[illegible]	(¹)	(¹)	56.7	(¹)	[illegible]	..
Mattoon, Ill	[illegible]	16.3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	73.2	[illegible]	53.0	42.0	33.0	[illegible]
Maud, Kans	30.3	23.7	42.5	58.2	[illegible]	70.5	[illegible]	[illegible]	(¹)	(¹)	(¹)	(¹)	....
Mauzy, Ind	19.2	(¹)	(¹)	53.1	[illegible]	67.3	72.4	[illegible]	[illegible]	[illegible]	[illegible]	(¹)	....
Maynard, Iowa	(¹)	14.1	21.2	43.4	61.5	62.3	[illegible]	63.1	(¹)	(¹)	(¹)	(¹)	.....
Mayport, Fla	[illegible]	[illegible]	[illegible]	[illegible]	74.1	[illegible]	[illegible]	[illegible]	80.4	71.7	(¹)	(¹)	....
Mazatlan, Mexico	[illegible]	[illegible]	71.1	[illegible]	77.9	[illegible]	[illegible]	[illegible]	[illegible]	78.1	77.1	[illegible]	[illegible]

¹ No record.

Monthly and annual mean temperature (in degrees Fahrenheit), &c.—Continued.

	°	°	°	°	°	°	°	°	°	°	°	°	°
McDonough, Md	30.7	35.0	31.7	51.0	61.1	73.4	73.9	71.1	61.2	53.2	42.4	34.2	51.6
Menand Station, N. Y	20.0	13.0	22.8	45.5	57.0	69.2	72.7	68.5	58.0	40.3	30.7	20.1	43.2
Mendon, Mass	23.0	16.0	25.0	48.5	56.0	67.4	71.0	66.7	54.7	52.4	41.1	29.3	46.9
Merritt's Island, Fla	(1)	(1)	(1)	(1)	(1)	78.5	80.1	80.6	79.4	73.1	60.9	68.0	....
Milan, Tenn	32.0	31.0	43.7	60.2	64.9	75.4	78.0	76.9	70.3	53.2	48.0	38.7	56.0
Milledgeville, Ga	44.0	42.4	49.8	62.3	[illegible]	79.2	82.0	79.0	73.3	60.0	(1)	(1)	....
Milton, Mass	(1)	19.2	(1)	45.1	52.1	65.2	71.0	66.3	62.7	(1)	42.4	32.0	....
Minneapolis, Minn	0.0	6.0	23.7	42.4	53.0	65.3	72.0	63.0	59.1	42.5	32.8	20.5	40.5
Monticello, Iowa	5.0	5.7	27.2	45.2	56.0	67.3	74.4	65.8	60.5	45.4	35.2	22.0	42.0
Moorestown, Mich	11.3	4.0	14.3	37.1	73.2	81.1	(1)	(1)	(1)	(1)	(1)	(1)	....
Moorestown, N. J	28.9	31.0	30.7	48.1	(1)	69.3	74.8	(1)	(1)	51.9	42.0	34.0	....
Mountainville, N. Y	20.0	18.0	23.3	47.0	54.3	67.0	72.4	67.5	60.1	48.8	40.4	28.1	47.0
Mount Forest, Canada	(1)	20.5	(1)	41.5	48.0	(1)	67.2	61.0	53.0	(1)	40.0	18.0	....
Mount Ida, Ark	(1)	28.7	48.4	63.0	64.0	74.5	77.7	72.3	71.5	58.8	54.0	42.0	....
Mount Vernon, Iowa	6.0	(1)	28.4	48.0	62.0	71.0	(1)	(1)	(1)	48.1	37.0	20.0	....
Muscatine, Iowa	11.1	10.4	31.0	47.0	58.0	68.2	76.8	68.0	63.0	47.0	37.1	10.7	45.8
Neillsville, Wis	−4.3	−1.0	15.0	34.7	48.5	60.7	65.5	58.3	51.9	38.3	28.0	11.3	30.1
Nephi, Utah	22.1	31.8	41.7	44.4	53.0	61.0	72.7	64.9	(1)	(1)	(1)	(1)	....
New Bedford, Mass	27.8	30.4	27.7	45.4	52.9	63.7	70.4	67.1	64.8	51.2	44.3	32.0	46.0
Newport, Vt	14.8	7.5	16.0	41.1	57.0	64.0	68.0	63.2	56.8	43.7	34.8	20.4	40.0
New Ulm, Tex	(1)	(1)	56.0	68.3	72.0	81.2	81.5	83.0	77.8	64.4	61.2	54.4	....
North Colebrook, Conn	20.6	14.5	17.5	41.8	51.2	64.7	71.0	67.5	61.0	51.7	41.0	25.7	44.8
Northfield, Minn	2.8	6.5	24.7	42.6	56.0	65.7	74.0	63.8	59.7	42.6	33.2	22.0	41.1
North Lewisburg, Ohio	22.4	19.6	30.1	49.9	62.1	68.4	75.8	74.1	64.0	52.0	46.2	31.7	49.8
North Volney, N. Y	19.7	12.4	14.0	38.2	54.0	63.2	69.7	63.7	57.0	46.7	39.2	27.7	42.0
Oakland, Cal	49.7	54.1	56.9	56.1	58.0	[illegible]	63.0	61.0	61.9	58.9	56.0	52.4	57.7
Orono, Me	16.0	12.8	19.2	40.8	51.9	61.0	67.0	63.3	54.4	44.5	36.4	25.0	41.4
Oroville, Cal	(1)	(1)	58.2	64.8	72.1	73.0	78.0	83.1	70.1	60.2	57.1	52.0	....
Oskaloosa, Iowa	(1)	(1)	(1)	(1)	(1)	(1)	(1)	68.9	62.0	44.9	(1)	24.1	....
Ottumwa, Iowa	12.0	15.0	31.2	48.7	60.8	68.7	77.1	70.3	64.2	(1)	(1)	(1)	....
Pacolet, S. C	37.0	35.0	44.1	[illegible]	67.0	73.6	78.0	76.5	70.9	54.2	47.0	40.7	57.0
Palermo, N. Y	17.7	8.8	17.1	38.0	54.0	61.1	67.0	63.0	56.4	46.1	36.7	25.0	41.0
Paramaribo (Dutch Guiana), South America	77.0	77.8	78.4	78.3	78.4	77.0	78.0	79.9	80.2	81.3	81.3	78.4	78.9
Paterson, N. J	30.0	28.0	(1)	47.0	(1)	67.1	(1)	71.0	(1)	(1)	(1)	32.8	....
Peoria, Ill	16.8	15.0	34.1	51.7	62.6	72.2	81.2	73.7	66.6	52.2	42.8	31.2	50.2
Phillipsburg, N. J	30.4	21.0	31.2	(1)	60.3	61.5	76.0	71.4	(1)	(1)	(1)	31.0	....
Pierce City, Mo	34.8	27.5	41.2	57.2	62.0	74.1	78.1	74.8	67.5	54.3	47.0	37.8	55.0
Point Pleasant, La	42.0	46.0	51.2	65.6	70.2	82.6	84.0	79.8	73.0	60.4	58.7	46.5	65.1
Portsmouth, Ohio	28.9	30.1	35.0	52.0	62.0	68.0	73.3	71.0	63.0	51.5	41.7	35.0	51.1
Post Mill Village, Vt	(1)	(1)	14.2	41.2	56.0	63.6	64.6	61.1	56.7	44.1	33.7	19.8	....
Poway, Cal	49.4	57.0	57.3	60.1	62.2	63.2	70.8	75.0	68.2	62.4	57.7	53.0	61.0
Prairie du Chien, Wis	7.2	0.0	27.3	45.0	58.5	68.4	74.6	68.4	61.4	45.0	30.0	24.8	42.0
Princeton, Cal	48.1	54.4	61.0	62.3	68.8	69.0	76.7	79.6	72.0	(1)	(1)	48.0	....
Princeton, Mass	(1)	12.8	21.0	43.3	52.1	62.1	68.5	62.0	60.0	47.4	37.5	27.0	....
Princeton, N. J	(1)	(1)	29.2	49.1	60.2	70.1	73.0	71.2	62.8	53.4	42.8	34.2	....
Providence, R. I	30.5	32.0	30.4	46.1	53.0	65.8	(1)	(1)	(1)	(1)	(1)	(1)	....
Pueblo, Colo	22.8	31.2	41.3	52.2	57.0	70.7	74.0	71.2	(1)	50.2	42.4	34.7	....
Puerto de Luna, N. Mex	31.5	30.4	47.4	57.4	62.8	74.4	70.1	70.0	67.7	54.9	40.5	41.0	50.8
Quakertown, Pa	27.4	18.8	28.4	45.1	55.4	77.1	72.0	67.4	(1)	48.0	38.3	30.7	....
Raleigh, N. C	40.0	(1)	(1)	60.0	70.0	78.0	80.0	70.0	(1)	50.0	50.5	44.0	....
Readington, N. J	32.7	28.8	(1)	52.8	62.0	72.0	80.3	74.7	66.0	58.2	47.8	38.8	....
Receiving Reservoir, D. C	31.4	29.8	34.3	51.0	63.3	74.2	80.7	76.2	66.0	55.9	45.0	36.0	54.3
Richardton, Dak	0.4	2.6	25.0	38.0	47.7	60.4	69.2	61.0	57.1	44.0	31.0	24.2	38.0
Richmond, Ky	28.5	28.0	38.0	55.5	68.4	71.6	(1)	74.0	68.8	52.7	44.4	38.8	....
Riley, Ill	8.0	7.7	24.8	42.2	54.4	64.7	71.0	64.1	60.8	44.6	35.0	22.2	41.0
Rock Creek Bridge, D. C	36.1	30.1	37.5	57.0	67.0	77.3	83.1	74.1	68.0	58.1	48.0	38.0	57.0
Rockford, Ill	11.2	7.6	26.8	43.7	55.9	65.0	72.3	65.3	60.7	45.0	38.0	24.2	42.0
Rowe, Mass	17.0	11.7	18.4	41.3	53.5	62.2	67.0	62.2	55.2	45.2	33.0	(1)	....
Ruggles, Ohio	20.7	16.5	30.2	44.0	56.3	62.7	71.3	64.4	58.0	(1)	31.0	21.5	....
Sacramento, Cal	46.4	53.3	56.5	60.0	63.6	67.0	70.6	71.5	67.2	64.4	54.4	50.0	60.0
Salem, N. J	32.1	28.9	33.0	51.7	62.2	73.1	78.6	75.4	(1)	(1)	(1)	(1)	....
Salina, Kans	20.7	28.2	(1)	55.4	[illegible]	76.0	79.0	73.3	66.0	54.0	42.0	35.0	....
Salinas City, Cal	44.7	50.3	54.1	56.5	57.0	58.4	61.4	58.0	58.0	56.2	52.7	52.0	55.4
Sandwich, Ill	10.9	8.1	20.0	44.7	56.0	68.0	70.0	68.7	62.9	49.0	30.4	28.1	42.0
Sherlock, Kans	18.0	26.2	42.3	55.3	60.1	72.0	77.2	(1)	(1)	61.0	44.0	25.1	....
Somerset, Mass	27.3	19.0	28.2	44.1	56.0	69.1	73.0	71.2	61.6	53.4	44.8	32.0	48.0
Somerville, N. J	28.3	21.6	28.0	48.1	60.2	71.0	73.7	71.7	63.5	51.0	42.9	[illegible]	48.7
South Bethlehem, Pa	[illegible]	29.1	27.0	46.0	58.1	69.0	72.5	68.3	62.4	51.0	41.0	(1)	....
South Evanston, Ill	(1)	(1)	34.0	43.0	49.3	61.5	(1)	(1)	(1)	(1)	27.0	23.4	....
Southington, Conn	24.0	17.6	25.0	46.7	58.0	68.4	73.0	(1)	56.5	49.9	40.5	31.0	....
South Orange, N. J	28.8	22.8	28.9	48.0	57.8	68.2	73.4	68.8	62.0	52.2	44.5	33.5	48.0
Spiceland, Ind	19.0	17.0	30.1	[illegible]	60.1	64.5	76.1	68.7	63.2	48.8	42.0	30.8	48.0
Springfield, Mo	20.1	27.4	42.2	56.0	(1)	(1)	77.0	73.6	67.6	(1)	41.0	30.0	....
Statesburg, S. C	46.0	40.0	48.3	62.2	65.9	78.4	78.3	74.2	71.8	58.8	52.9	42.9	60.5
Statesville, N. C	38.0	30.0	43.7	60.0	68.9	78.4	80.4	74.2	70.6	57.0	48.9	42.1	58.0
Sterling, Kans	18.0	28.4	37.8	54.1	60.0	78.1	78.0	72.0	65.0	54.7	43.2	34.5	51.1
Stockham, Nebr	(1)	(1)	(1)	(1)	(1)	(1)	80.7	68.1	78.8	62.3	51.0	43.2	....

[1] No record.

Monthly and annual mean temperature (in degrees Fahrenheit), &c.—Continued.

	°	°	°	°	°	°	°	°	°	°	°	°	°
Strafford, Vt	15.7	11.0	17.9	42.3	56.8	64.7	68.8	63.9	58.9	47.0	34.7	22.6	42.0
Summit, Va	34.6	28.8	36.1	52.7	62.7	70.8	77.8	75.0	68.7	54.2	44.9	35.5	53.3
Sunman, Ind	22.9	22.0	32.9	52.0	63.9	72.6	79.5	73.0	64.8	51.1	41.4	31.9	50.7
Sussex, Wis	7.6	7.5	22.0	40.8	53.2	64.5	71.4	(¹)	(¹)	(¹)	(¹)	(¹)	....
Swanwick, Ill	22.2	22.3	38.2	54.8	63.2	72.4	(¹)	74.8	(¹)	(¹)	(¹)	(¹)	....
Swartz Creek, Mich	14.9	8.2	20.0	42.7	54.4	63.6	72.1	(¹)	57.0	44.7	37.6	27.7	....
Sycamore, Ill	10.2	8.7	25.7	42.6	54.2	65.5	71.6	64.4	60.0	44.8	36.6	22.9	42.3
Tacoma, Wash	(¹)	45.0	48.2	54.0	(¹)	60.0	66.4	64.5	58.8	51.4	45.6	41.4	....
Tallahassee, Fla	48.5	(¹)	57.5	68.0	75.6	(¹)	83.3	81.0	74.0	65.0	62.6	56.7	....
Taunton, Mass	27.8	21.4	28.8	41.6	54.7	66.3	71.9	68.3	58.9	51.4	44.4	33.3	47.4
Tecumseh, Nebr	17.3	19.7	38.1	(¹)	(¹)	72.8	81.0	76.2	67.4	53.6	40.3	30.8	....
Thornville, Mich	17.8	10.6	21.0	44.4	57.2	66.4	73.0	64.7	61.6	48.0	39.6	29.4	44.5
Tiffin, Ohio	18.6	11.6	27.2	46.8	60.0	68.0	76.6	71.0	63.2	49.8	38.9	34.6	46.8
Topeka, Kans	17.2	20.0	46.0	55.8	61.8	74.0	78.5	74.0	67.9	54.1	45.4	35.2	52.5
Troy, Pa	21.7	14.3	21.5	49.1	55.6	65.1	70.6	64.6	57.4	47.0	38.2	29.3	44.4
Variety Mills, Va	33.6	29.6	37.1	55.0	62.5	(¹)	(¹)	(¹)	(¹)	52.0	43.6	37.6	....
Vermillion, Dak	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	62.5	46.3	39.0	27.0	....
Vevay, Ind	26.7	26.1	35.7	55.0	63.8	71.9	78.4	74.3	66.7	53.9	46.5	36.9	52.9
Vineland, N. J	32.2	26.9	31.8	51.8	62.0	72.0	78.8	69.3	66.6	54.7	45.7	35.2	52.9
Wabash, Ind	19.0	15.6	30.0	47.8	58.7	70.4	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	....
Washington City	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	65.5	57.8	42.7	(¹)	....
Waterville, Me	13.5	15.0	22.4	43.4	54.1	67.1	(¹)	(¹)	57.5	46.1	39.4	31.3	....
Wausau, Wis	1.8	5.6	19.3	39.7	52.2	62.9	69.3	60.7	57.4	40.6	31.9	20.5	38.5
Wauseon, Ohio	15.6	11.9	24.6	45.3	56.9	66.5	74.4	65.6	60.7	48.9	38.5	28.1	44.6
Webster, Dak	4.2	6.6	27.6	45.0	57.5	67.4	74.8	67.1	61.9	45.3	31.4	22.2	42.7
Weldon, N. C	39.5	34.2	41.2	57.4	65.8	76.0	80.5	77.6	71.1	57.7	48.2	32.4	57.5
Wellington, Kans	18.0	24.6	41.6	54.5	64.4	74.4	76.6	74.4	66.2	53.8	45.2	34.9	52.5
Wellsborough, Pa	23.4	16.7	22.4	43.3	55.2	64.5	71.5	65.9	58.1	50.3	41.4	31.3	45.3
Westborough, Mass	25.9	20.6	27.8	48.0	58.7	67.6	75.2	68.9	60.1	51.8	42.5	32.7	48.0
West Chester, Pa	27.8	21.5	28.8	48.7	68.5	68.9	76.0	69.9	62.7	52.2	42.6	33.7	49.3
Westerville, Ohio	23.7	18.6	28.8	48.2	60.1	60.2	73.2	65.6	60.7	48.8	40.1	31.5	47.0
West Leavenworth, Kans	(¹)	(¹)	(¹)	52.5	63.0	73.0	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	....
Westmoreland, Kans	(¹)	(¹)	(¹)	61.0	59.4	71.0	(¹)	77.8	63.9	50.0	43.0	31.6	....
West Union, Iowa	2.2	6.8	23.8	42.0	53.5	62.8	70.6	63.9	58.0	42.7	33.9	20.4	40.0
White Plains, N. Y	29.6	22.6	29.9	46.6	57.7	67.7	73.9	69.9	63.3	53.5	44.3	32.4	49.0
Wilkesbarre, Pa	24.8	17.8	25.6	46.3	58.2	67.0	72.4	66.6	59.9	49.6	38.7	32.3	46.7
Williamstown, Mass	22.6	13.7	17.4	44.8	55.0	64.6	64.8	61.5	56.2	47.0	30.0	22.6	42.9
Wilton Centre, Ill	11.9	10.6	26.7	44.8	50.0	67.0	74.2	66.6	61.8	(¹)	(¹)	(¹)	....
Woodstock, Md	30.0	24.6	30.0	51.2	61.6	69.6	76.2	71.0	62.5	51.9	43.1	34.6	50.0
Woodstock, Vt	15.0	0.7	17.8	41.5	54.8	64.3	68.7	63.0	56.1	44.8	34.5	(¹)	....
Worcester, Mass	22.9	16.0	23.5	42.5	52.4	63.7	68.9	64.5	57.4	47.5	39.2	28.9	44.0
Wyandotte, Kans	21.5	19.2	44.0	52.8	62.7	71.2	79.8	73.2	67.8	53.0	47.6	29.3	51.8
Wysox, Pa	(¹)	(¹)	(¹)	50.6	56.2	64.2	71.6	68.4	61.0	52.8	39.5	26.5	....
Wytheville, Va	38.0	29.8	37.0	52.0	60.5	70.6	73.0	70.0	63.1	51.4	44.9	36.1	51.8
Yates Centre, Kans	17.4	21.1	40.4	54.7	62.0	73.1	78.2	74.1	65.6	50.5	48.2	32.4	51.5
Yellow Springs, Ohio	(¹)	(¹)	30.0	49.4	61.1	68.0	74.2	69.4	61.8	49.4	41.4	33.3	....
Yutan, Nebr	9.4	14.6	34.5	49.8	60.5	71.2	75.6	(¹)	(¹)	48.0	27.6	27.0	....

¹ No record.

APPENDIX 34.

Monthly maximum and minimum temperatures and annual range of temperature (in de- ***States Army, for the year end-***

[From self-register-

										n.	June.	
											Max.	Min.
											°	°
											96	50
											(1)	(1)
											82	50
											90	51
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	90	42
Amherst (agri. sta.), Mass	57	—18	39	—15	50	—11	83	19	85	21	89	35
Amherst, Mass	59	— 8	41	— 8	54	— 3	83	22	83	31	90	51
Anna, Ill	63	—12	60	— 0	70	18	81	33	85	32	93	49
Ann Arbor, Mich	44.2	—17	46	—23	40	— 6	80	19	81	28	(1)	42
Archer, Fla	81	31	79	32	79	33	90	47	91	56	93	70
Asheville, N. C	62	10	(1)	(1)	76	13	82	28	83	39	95	57
Ashwood, Tenn	66	2	68	3	74	16	81	34	86	42	96	62
Atchison, Kans	44	—12	53	—18	70	17	77	30	86	36	93	53
Athens, Ga	60	16	60	7	70	20	85	30	88	40	92	53
Auburn, N. Y	31	— 2	42	— 8	60	—10	83	20	79	29	83	44
Austin, Tenn	62	zero.	69	2	76	10	81	35	88	37	91	50
Austin, Tex	78	24	77	24	76	41	85	56	(1)	(1)	96	64
Bainbridge Island, Wash	58	28	59	31	70	33	76	30	81	34	84	50
Bandon, Oreg	58	29	(1)	(1)	60	20	(1)	(1)	(1)	(1)	(1)	(1)
Beloit, Wis	40	—24	42	—24	56	— 3	76	22	86	28	84	42
Bird's Nest, Va	70	16	67	11	68	15	82	37	81	53	95	58
Birmingham, Ala	(1)	(1)	74	10	74	21	88	34	94	42	99	56
Birmingham, Mich	(1)	(1)	(1)	(1)	46	—13	79	16	80	23	84	41
Blooming Grove, Pa	62	zero.	48	—10	53	—10	86	24	80	31	89	47
Blue Hill, Mass	(1)	(1)	40	— 3	55	— 0.0	79	24	83	32	89	42
Blue Lake, Cal	61	27	66	30	78	33	77	26	81	37	76	34
Boyne, Mich	(1)	(1)	(1)	(1)	49	—34	83	zero.	86	15	93	28
Brattleborough, Vt	(1)	(1)	(1)	(1)	(1)	(1)	84	22	87	24	90	39
Bunker Hill, Ill	60	—19	60	—13	75	11	81	24	92	34	93	41
Burlington, Vt	53.6	—14.9	38	—18	48	—17	86	14	83	28	89	42
Carson City, Nev	59	15	65	17	73	20	77	28	93	29	91	30
Carthage, Mo	66	—17	62	— 8	79	20	88	33	90	34	93	56
Catawissa, Pa	60.5	1	48	—11	58	— 0.5	80	24	86	34	89	44
Cedar Rapids, Iowa	42	—30	44	—28	60	— 2	74	16	86	24	90	42
Centreville, Mo	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	93	46
Chambersburg, Pa	54	2	46	— 4	62	8	86	27	91	38	96	53
Chapel Hill, N. C	77	14	68	9	75	17	94	20	90	50	94	63
Charleston, Ill	(1)	(1)	60	zero.	64	4	79	22	86	33	93	38
Charlotte, Vt	50	—16	40	—20	50	—14	85	10	84	29	93	44
Chester, Minn	35	—53	39	—30	47	—10	73	14	85	21	90	34
Cincinnati, Ohio	62	—10	58	— 9	70	5	85	30	89	41	96	52
Clay Centre, Kans	57	—22	61	—21	75	12	80	30	84	34	99	55
Cleburne, Tex	80	4	72	8	70	26	88	42	90	46	93	62
Cleveland, Ohio	53.5	—0.8	46	—15	65	— 5	84	23	83	30	83	47
Clyde, Ohio	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	80	40	90	53
College City, Cal	67	34	75	35	87	37	93	40	100	50	103	51
College Hill, Ohio	48	—12	53	—15	62	3	82	27	92	40	97	50
Collinsville, Ill	62	—13	63	—11	74	12	78	29	90	35	91	51
Conception, Mo	49	—21	47	—23	63	2	75	22	83	29	87	47
Contoocook, N. H	61	—19	43	—10	56	—16	87	20	87	27	90	42
Cooperstown, N. Y	56	—12	36	—12	54	—14	82	15	81	30	83	44
Cornish, Me	46	—13	41	—14	48	—10	80	23	83	32	86	43
Corpus Christi, Tex	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	98	76
Cresco, Iowa	34	—38	37	—32	48	—15	72	18	85	27	85	43
Crete, Neb	57	—25	57	—21	70.2	10	78	20	82	29	93	41
Cumberland, Md	60	4	50	— 5	60	6	80	26	82	40	86	50
Dale Enterprise, Va	66	3	56	—10	76	7	88	29	87	40	94	51

(1) No record.

APPENDIX 34.

grees Fahrenheit), from reports made by voluntary observers of the Signal Service, United ing December 31, 1885.

ing thermometers.]

July.		A										
Max.	Min.	Max										
°	°	°										
101	62	96	54	94	46	80	34	75	29	66	13	96
(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	[illegible]	30	73	24	....
98	60	92	52	88	44	84	36	65	[illegible]	60	30	74
103	58	107	46	104	32	93	25	80	22	75	−1	124.5
90	51	93	43	84	43	78	30	69	10	55	3	97
93	41	87	31	81	27	80	24	70	11	65	6	111
94	56	87	45	82	40	71	31	67	15	55	8	102
96	58	96	53	84	47	80	36	76	28	64	13	108
91	80	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	....
91	71	94	70	94	67	88	44	80	28	77	20	74
(1)	(1)	(1)	(1)	(1)	(1)	77	30	60	25	(1)	(1)	....
96	56	98	60	90	50	76	33	68	25	63	17	96
96	62	91	54	87	49	79	28	76	21	58	1	116
95	55	96	56	88	49	78	34	70	29	65	20	80
88	46	93	43	74	39	74	24	68	21	65	7	98
96	52	(1)	(1)	(1)	(1)	78	32	73	23	65	18	....
98	52	96	66	94	56	84	43	83	34	79	29	....
87	50	88	40	75	44	68	35	80	35	60	24	64
73	45	60	41	73	41	71	33	60	32	60	32	....
96	44	86	44	82	40	(1)	(1)	(1)	(1)	(1)	(1)	....
99	67	96	50	91	53	85	41	74	33	67	20	88
(1)	(1)	(1)	(1)	93	50	80	33	77	25	63	20	....
90	51	(1)	(1)	79	37	72	21	61	22	48	−7	....
94	52	90	48	83	40	75	24	67	8	51	−0.6	108
91	48	96	43	78	33	[illegible]	29	65	10	58.6	7	....
89	44	96	45	(1)	(1)	91	36	58	32	64	29	....
95	27	(1)	(1)	96	27	(1)	(1)	[illegible]	17	(1)	(1)	....
94	42	89	37	86	34	63	26	64	6	54	4	....
102	60	90	47	91	40	64	30	75	22	61	−4	121
90	50	84	48	80	36	75	24	67	6	56	−0.7	108
100	43	90	42	95	30	86	23	72	15	62	17	86
89	60	94	53	(1)	(1)	83	20	79	18	64	−3	....
96	50	90	41	83	42	80	32	71	12	56	5	107
98	53	88	41	82	30	73	24	60	10	44	−10	126
97	53	(1)	(1)	87	36	94	23	71	14	64	−5	....
102	58	96	52	85	52	79	36	70	29	60	10	106
109	61	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	....
103	46	96	45	88	42	79	28	69	20	56	−4	....
92	56	88	47	81	38	71	22	64	8	50	zero.	113
(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	....
(1)	(1)	(1)	(1)	80	44	84	32	73	28	60	4	....
100	60	100	60	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	....
95	68	96	58	91	53	84	34	84	22	64	16	92
92	54	86	44	81	43	78	33	68	23	62	3	107
95	62	87	48	82	45	78	30	66	24	55	−2	....
108	60	114	48	65	44	101	42	78	38	64	34	99
103	57	98	54	104	41	81	29	74	25	49	2	118
98	53	93	47.8	86	[illegible]	77	28	73.5	26	58	4	109
95	53	90	53	86	45	77	29	69	29	56	−7	118
(1)	(1)	90	30	83	33	76	26	64	1	53	9	....
85	50	82	44	76	37	[illegible]	26	68	15	54	4	99
89	54	88	45	77	37	80	28	54	10	49	zero.	103
94	78	93	79	93	70	91	54	92	51	(1)	(1)	....
98	57	82	45	86	37	73	22	65	14	46	−22	129
98	51	91	47	92	43	82	23	72	19	60	−9	119
95	56	88	45	80	44	76	32	66	25	58	8	101
100	51	96	48	95	30	78	35	73	28	62	9	110

[1] No record.

Monthly maximum and minimum temperature and annual range

							ril			une.		
							)				.	Min.
				°	°	°	°					°
Deerfield, Mass	50	-15	46	-14	58	-13	85	28	88	25	94	37
Des Moines, Iowa	51	-26	54	-24	65	3	74	20	87	28	89	38
De Soto, Nebr	49	-26	49	-19	66	7	84	25	90	23	91	45
Distributing, Reservoir, D. C	61	8	53	4	67	13	86	32	87	46	94.7	56
Dorset, Vt	55	-15	39	-15	53	-16	[illegible]	11	83	24	86	35
Dover, N. J	58	6	49	1	54	2	87	26	85	29	96	30
Drifton, Pa	62	-9	45	-16	51	-6	85	18	85	[illegible]	67	41
Dudley, Mass	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	82	56
Dyberry, Pa	52	-12	37	-15	46	-18	43	17	84	23	85	38
Easton, Pa	58	6	50	zero.	60	10	67	33	87	47	83	63
East Portland, Oreg	56	16	53	28	74	30	76	30	(1)	(1)	87	56
Elk Falls, Kans	(1)	(1)	38	-10	50	18	72	42	79	46	70	56
Embarrass, Wis	36	-39	46	-35	52	-15	76	16	85	25	89	44
Emmittsburg, Md	56	7	40	-1	60	7	82	29	89	38	89	52
Emporia, Kans	57	-12	61	-14	75	14	78	31	88	36	92	51
Eola, Oreg	62	31	68	32	72	34	74	38	78	43	78	49
Factoryville, N. Y	49	-16	42	-15	64	-10	86	23	84	22	86	40
Fairbury, Nebr	(1)	(1)	(1)	(1)	66	30	(1)	(1)	67	[illegible]	(1)	(1)
Fall Brook, Cal	73	37	85	37	[illegible]	41	89	46	84	57	97	53
Fall River, Mass	65	-2	51	2	56	5	80	25	78	33	88	42
Fallsington, Pa	57	4	40	-1	59	7	84	29	83	42	92	55
Fallston, Md	54	1	49	zero.	60	6	87	29	88	45	90	33
Forsyth, Ga	72	19	73	14	76	33	86	40	86	50	92	64
Fort Madison, Iowa	45	[illegible]	48	[illegible]	65	3	77	25	88	36	90	45
Fort Scott, Kans	57	-12	66	-11	78	18	83	32	90	41	96	64
Fort Wayne, Ind	56	-15	56	-15	57	1	80	28	84	35	93	46
Frankfort, Ky	58	-6	63	-5.8	74	10	83	26	84	36	92	51
Franklin, Pa	54	-16	42	-18	40	-13	80	12	80	32	84	38
Fremont, Nebr	48	-29	50	-24	67	8	81	19	87	27	92	43
Gallinas Spring, N. Mex	(1)	(1)	(1)	(1)	60	33	71	44	84	49	92	54
Gardiner, Me	51	-15	44	-18	60	-14	70	21	79	27	83	39
Garrettsville, Ohio	54	-19	48	-18	52	-18	82	8	82	24	88	36
Genoa, Nebr	44	-23	52	-24	67	8	[illegible]	19	88	26	90	44
Germantown, Pa	60	2	[illegible]	4	56	7	80	28	79	38	90	55
Grampian Hills, Pa	44	-8	42	-16	46	-10	68	14	84	30	86	44
Grand Coteau, La	76	21	73	25	78	36	86	50	86	56	92	66
Great Falls Reservoir, Md	64	4	50	4	61	11	80	30	86	43	92	56
Greensborough, Ala	70	19	70	16	75	28	82	40	88	50	94	60
Green Springs, Ala	78	16	69	13	74	24	88	35	87	50	94	68
Guilford, Ind	(1)	(1)	56	-14	70.2	-0.2	80	24	89	32	97	47
Guttenberg, Iowa	43	-36	46	-30	50	-14	74	24	88	22	88	42
Hartford, Conn	50	-6	45	-2	56	-1	86	24	68	30	94	61
Harvard, Nebr	(1)	(1)	60	18	68	8	82	30	84	30	96	40
Haverford College, Pa	60	2	42	-3	50	5	80	20	79	36	90	50
Helvetia, W. Va	60	-6	62	-22	65	-4	[illegible]	16	84	32	88	42
Hiram, Ohio	50	-12	48	-19	50	-7	80	20	81	34	87	44
Hudson, Mich	45	-23	49	-26	60	-16	82	17	85	23	93	39
Humboldt, Iowa	40	-42	38	-31	60	-1	[illegible]	22	88	[illegible]	94	42
Humphrey, N. Y	40	-14	46	-24	45	-19	78	14	82	23	84	41
Huntsville, Texas	(1)	(1)	80	18	77	34	86	29	85	[illegible]	91	64
Hydesville, Cal	66	30	72	34	78	42	76	[illegible]	(1)	(1)	74	50
Independence, Iowa	35	-26	39	-22	59	-1	76	27	79	34	83	46
Independence, Kans	54	-13	61	-8	78	21	[illegible]	31	84	38	90	55
Independence, Mo	59	-14	54	-20	63	12	77	25	86	38	92	46
Indianola, Iowa	45	-22	45	-26	62	2	75	30	84	30	(1)	(1)
Ithaca, N. Y	56	-8	44	-12	52	-14	86	[illegible]	83	29	88	41
Jacksonborough, Ohio	48	-17	52	-17	62	6	86	23	94	33	94	48
Jeffersonville, Ind	68	-9	63	-6	74	13	83	32	90	38	93	52
Kalamazoo, Mich	41	-10	44	-25	48	-8	77	21	80	31	73	42
Kennewick, Wash	60	-4	56	20	84	28	84	28	92	40	98	50
Laconia, Ind	60	-10	65	-6	74	11	83	31	83	32	95	55
Lafayette, Ind	50	-33	50	-20	64	-3	79	23	87	34	90	36
La Grange, Ind	42	-18.5	46	-21	49	-8	78	19	80	28	(1)	(1)
Lansing, Mich	45	-16	45	-22	[illegible]	-10	80	23	80	29	85	41
Lawrence, Kans	56	-12	55	-14.5	73	15	(1)	(1)	(1)	(1)	92	51
Lead Hill, Ark	73	-5	78	-4	84	18	87	33	96	36	102	57
Leicester, Mass	65	-7.6	48	-10	63	-6	79	20	83	26	89	41
Lenoir, N. C	62	11	(1)	(1)	68	15	81	24	(1)	(1)	87	52
Le Roy, N. Y	55	-7	47	-12	53	-7	87	21	86	28	88	41
Liberty Hill, La	68	10	74	16	76	32	84	62	86	60	91	81
Limona, Fla	83	38	85	36	85	39	[illegible]	49	96	65	95	60
Lincolnton, N. C	61	14	64	8	(1)	(1)	72	30	77	50	92	60
Logan, Iowa	56	-30	52	-22	63	(1)	76	20	90	26	96	42
Logansport, Ind	51	-25	60	-24	64	-8	83	24	80	33	94	42

[1] No record.

of temperature (in degrees Fahrenheit), &c.—Continued.

96	44	88	40	88	38	77	29	68	18	57	6	95
(1)	(1)	90	40	82	38	77	27	73	12	50	— 4	....
88	42	85	35	77	31	72	32	65	20	57	— 1	....
90	40	86	36	78	35	72	20	67	2	48	—10	111
101	64	92	55	86	53	88	[illegible]	79	29	(1)	(1)	....
96	56	99	48	82	44	78	30	65	31	54	22	....
(1)	(1)	(1)	(1)	67	45	(1)	32	66	25	47	5	....
90	56	83	54	86	36	76	26	53	20	46	—22	127
98	50	(1)	(1)	86	47	73	30	65	37	61	10	....
97	67	97	51	85	49	[illegible]	28	75	23	[illegible]	zero.	111
98	62	90	50	89	48	77	39	57	34	53	27	77
92	47	94	42	89	36	76	29	70	10	53	— 4	112
109	66	97	70	90	65	88	43	(1)	(1)	64	18	....
101	55	115	60	110	40	105	42	85	[illegible]	66	24	81
89	53	87	46	80	40	79	33	64	27	68	11	90
97	59	90	51	82	[illegible]	75	34	[illegible]	26	58	19	96
97	52	99	50	81	[illegible]	76	37	70	28	65	[illegible]	97
94	67	95	64	92	64	82	42	79	32	72	24	81
108.2	63	95	40	85	48	75	29	66	23	68	— 9	122.9
(1)	(1)	(1)	(1)	(1)	(1)	78	[illegible]	72	22	63	6	....
96	56	98	56	87	[illegible]	77	30	72	28	57	— 2	113
97	50	94	53	85	40	77	32	71	26	60	8	[illegible]
88	48	84	40	76	33	72	32	64	10	65	— 0.6	[illegible]
90	55	90	47	91	46	81	24	67	16	[illegible]	— 7	126
93	60	95	[illegible]	85	54	(1)	34	67	34	57	10	....
83	50	83	43	76	40	66	27	58	16	54	5	90
92	43	89	38	84	36	70	24	67	13	61	—12	111
100	49	83	51	90	46	83	23	66	21	68	— 4	124
(1)	(1)	89	40	84	44	74	33	70	20	50	11	....
94	52	90	42	82	38	78	26	61	4	50	— 8	110
94	60	97	66	89	62	80	43	83	34	73	26	79

100	54	94	60	87	42	73	32	70	25	60	19	96
95	66	(1)	(1)	92	66	81	42	76	31	[illegible]	[illegible]	....
95	67	96	65	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	....
99	47	99	49	85	30	74	20	66	22	54	0.2	....
96	53	88	44	86	36	80	24	(1)	(1)	[illegible]	—12	....
96	49	88	41	84	36	72	27	66	13	58	7	102
110	34	(1)	(1)	100	48	92	24	64	23	65	6	....
(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	....
96	38	92	39	66	32	72	29	70	26	70	zero.	118
92	54	90	48	81	30	75	33	65	21	60	1.8	111
96	47	88	37	(1)	(1)	77	13	67	14	47	—7	....
99	52	90	42	88	32	76	22	62	18	52	—10	141
90	54	85	47	80	36	75	33	60	25	48	—5	114
94	66	95	63	96	50	84	41	83	34	79	26	....
(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	....
92	50	81	47	76	44	70	27	56	21	43	—10	118
100	61	95	55	97	52	84	30	78	28	65	1	118
93	54	90	52	90	42	[illegible]	26	(1)	(1)	(1)	(1)	....
(1)	(1)	89	40	83	44	75	25	(1)	(1)	(1)	(1)	....
96	46	87	40	80	38	77	26	[illegible]	9	54	2	110
100	53	101	49	90	36	80	24	[illegible]	20	50	—5	118
98	51	95	52	86	41	76	34	[illegible]	26	50	6	107
91	49	83	43	[illegible]	37	(1)	(1)	60	25	51	—3	116
104	52	112	[illegible]	91	32	83	24	61	26	56	10	116
100	55	96	52	86	40	77	30	76	26	61	8	110
99	42	94	42	[illegible]	35	77	30	68	18	50	—10	122
(1)	(1)	90	43	(1)	(1)	(1)	(1)	62	24	40	—7	....
91	47	83	41	82	34	78	18	64	21	48	—6	113
96	56	(1)	(1)	(1)	(1)	77	29	(1)	(1)	57	—3	....
107	80	104	53	88	45	96	29	81	30	73	zero.	112
(1)	(1)	86	39	80	34	76	26	(1)	(1)	57	4	....
90	53	86	55	83	42	68	32	66	22	54	13	....
98	44	90	38	84	34	79	28	68	20	58	—1	100
93	79	94	70	87	60	76	54	79	47	75	34	84
95	70	98	71	97	71	86	50	67	30	85	28	70
88	60	84	62	81	40	66	27	64	28	56	17	....
86	52	96	46	96	46	(1)	(1)	64	16	46	0.9	....
102	46	100	45	95	38	82	30	74	25	60	—5	127

[1] No record.

Monthly maximum and minimum temperature and annual range

Stations.	January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.
	°	°	°	°	°	°	°	°	°	°	°	°
Luling, La	76	23	78	26	81	32	85	49	90	53	93	64
Lunenburg, Vt	50	—19	34	—26	48	—24	80	8	82	28	85	43
Madison, Nebr	44	—24	48	—22	60	7	73	21	81	30	85	48
Madison, Wis	40	—25	40	—22	54	—5	74	21	84	27	(1)	(1)
Mahonoy Plane, Pa	(1)	(1)	42	—12	55	2	84	26	87	40	92	52
Manatee, Fla	86	42	86	37	92	48	88	59	87	69	94	63
Manchester, Iowa	39	—26	42	—25	60	—10	72	22	90	25	88	43
Manhattan, (B) Kans	56	—20	56	—18	65	12	74	26	90	32	98	51
Manistique, Mich	45	—36	42	—28	50	—29	65	6	78	24	80	32
Manitowoc, Wis	38	—24	43	—24	48	—11	64	18	82	18	82	36
Marietta, Cal	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Marion, Va	65	4	56	— 8	65	13	83	29	81	35	86	55
Marquette, Nebr	42	—24	48	— 6	66	13	77	44	82	45	94	50
Mattoon, Ill	45	—20	53	—14	70	8	70	29	89	35	90	47
Maud, Kans	58	—18	64	— 9	78	21	84	36	89	33	101	54
Mauzy, Ind	48	—20	43	—20	(1)	(1)	78	20	82	30	87	40
Maynard, Iowa	36	—36	36	—29	50	—16	67	18	86	30	84	38
Mayport, Fla	81	41	76	38	85	40	88	58	88	64	95	74
Mazatlan, Mex	79	51	79	54	82	55	84	57	88	60	92	66
McDonogh, Md	50	4	46	— 3	80	7	91	28	82	57	86	53
Menand Station, N. Y	52	—11	40	—10	45	— 6	83	26	84	38	85	47
Meudon, Mass	57	— 4	42	— 4	54	4	76	30	76	37	87	46
Merritt's Island, Fla	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	92	71
Milan, Tenn	65	— 1.5	72	5	76	5	82	35	89	38	95	59
Milledgeville, Ga	71	21	71	13	75	24	80	32	90	44	94	60
Milton, Mass	54	— 6	46	— 3	55	5	79	30	80	30	91	47
Minneapolis, Minn	42	—38	44	—30	49	— 7	70	19	86	28	87	41
Monticello, Iowa	41	—28	45	—26	62	— 7	74	21	85	25	90	39
Moorestown, Mich	42	—32	47	—32	45	—33	78	2	85	18	(1)	(1)
Moorestown, N. J	55	4	42	— 2	63	6.5	85	27	(1)	(1)	96	55
Mottville, Mich	44	—24	50	—33	50	—10	80	22	84	38	86	40
Mountainville, N. Y	60	zero	46	— 7	53.7	— 4	86	24	86	31	91	41
Mount Forest, Canada	44	—17	36	—21	37	—18	76	7	66	30	82	39
Mount Ida, Ark	(1)	(1)	72	6	78	22	86	32	84	36	91	56
Mount Vernon, Iowa	41	—27	46	—28	62	— 4	79	22	90	34	93	53
Muscatine, Iowa	48	—34	44	—30	61	3	77	21	85	29	91	41
Nayatt's Point, R. I	54	zero	38	3	68	2	82	31	82	40	90	58
Neillsville, Wis	32	—42	36	—37	41	—20	65	8	87	16	88	27
Nephi, Utah	52	zero	55	16	70	17	67	30	83	30	88	35
New Bedford, Mass	53	1	44	0.5	54	2	74	27	80	32	85	46
Newport, Vt	50	—21	40	—40	48	—30	86	14	84	28	88	42
New Ulm, Tex	(1)	(1)	(1)	(1)	80	35	78	60	79	59	85	78
North Colebrook, Conn	55	—18	46	—11	52	— 6	80	18	82	22	83	45
Northfield, Minn	37	—40.9	40	—31	50	—12	75	16	84	25	86	35
North Lewisburg, Ohio	49	—16	53	—17	60	— 2	80	20	85	33	92	44
Northport, Mich	34	— 8	40	—22	54	—18	74	20	80	20	(1)	(1)
North Volney, N. Y	49	—11	39	— 7	50	— 9	87	19	84	29	87	45
Oakland, Cal	60	—37	70	41	76	43	78	42	86	49	71	52
Orono, Me	53	—22	41	—17	49	—21	76	20	79	28	86	39
Oroville, Cal	(1)	(1)	(1)	(1)	86	46	84	42	96	52	90	57
Oskaloosa, Iowa	44	—21	46	—20	60	2	73	26	85	33	84	47
Ottumwa, Iowa	43	—22	48	—23	63	10	80	29	86	33	91	50
Pacolet, S. C	62	16	60.7	8.9	61	20	76	41	75	63	84	65
Palermo, N. Y	46	—13	36	—11	48	—19	84	16	80	39	84	42
Paramaribo (Dutch Guiana), S. A	88	66	88	66	89	68	91	67	89	70	88	70
Paterson, N. J	60	4	41	— 4	(1)	(1)	85	29	(1)	(1)	88	54
Peoria, Ill	48	—22	49	—22	64	10	79	30	89	37	95	48
Phillipsburg, N. J	60	2	40	— 1	66	2	(1)	(1)	84	33	90	46
Pierce City, Mo	63	—11	63	— 8	79	17	84	32	87	34	93	55
Pleasant Grove, Wash	48	— 6	53	10	75	18	77	18	87	32	86	40
Point Pleasant, La	69	19	69	20	78	30	88	46	86	55	93	67
Portsmouth, Ohio	66	— 4	68	— 6	74	7	93	26	91	40	92	49
Post Mill Village, Vt	(1)	(1)	43	—26	55	—20	86	16	84	29	89	37
Poway, Cal	71	30	84	32	87	37	88	46	80	52	90	55
Prairie du Chien, Wis	45	—29	41	—22	52	—5.9	60	—23.1	84	30	93	45
Princeton, Cal	66	34	72	33	85	40	84	31	101	44	95	44
Princeton, Mass	46.8	—10.5	36	—11	49	—4	79	21	79	21	84	41
Princeton, N. J	(1)	(1)	(1)	(1)	58	4	85	26	84	37	95	49
Providence, R. I	60	—4	52.2	1	59	2	83	23	85	28	88	44
Pueblo, Colo	68	—16	64	—3	73	20	79	32	90	37	92	54
Puerto de Luna, N. Mex	49	—12	60	10	74	25	78	41	86	41	98	61
Quakertown, Pa	57	zero	45	—4	52	2	82	24	80	31	89	43
Raleigh, N. C	69	16	(1)	(1)	(1)	(1)	90	36	89	50	94	65
Readington, N. J	64	6	48	—2	(1)	(1)	92	34	96	44	98	60
Receiving Reservoir, D. C	64	4	56	3	65	10	86	31	67	46	93	58

(1) No record.

of temperature (in degrees Fahrenheit), &c.—Continued.

July.		August.		September.								
Max.	Min.	Max.	Min.	Max.	Min.							
°	°	°	°	°	°							
94	60	93	61	90	60	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
85	48	83	36	75	35	74	21	60	10	63	—4	111
95	50	81.2	54.1	([1])	([1])	([1])	([1])	60	18	61	zero.	....
90	53	82	46	79	42	71	26	([1])	([1])	61	—13	....
97	58	89	53	84	45	74	[illegible]	67	13	53	8	....
92	70	93	77	98	74	88	55	89	40	86	28	68
99	54	87	48	86	42	78	27	60	20	50	—8	125
102	60	98	41	93	53	([1])	([1])	74	22	68	—4	132
92	41	95	37	80	29	98	22	58	22	46	—8	126
92	46	84	41	88	34	67	24	54	10	46	—15	116
105	50	111	58	107	45	100	35	80	27	90	27	....
89	46	88	51	84	38	69	28	60	25	68	16	97
93	56	90	59	87	52	78	37	63	31	64	16	118
102	58	93	61	90	37	81	29	60	23	61	—2	123
103	64	104	54	([1])	([1])	([1])	([1])	([1])	([1])	([1])	([1])	....
94	42	92	41	81	33	72	24	67	15	([1])	([1])	....
98	54	88	40	([1])	([1])	([1])	([1])	([1])	([1])	([1])	([1])	....
93	73	93	73	99	72	86	58	([1])	([1])	([1])	([1])	....
92	61	93	65	92	68	88	67	85	63	80	60	42
93	54	87	45	80	42	72	33	69	27	60	8	96
92	57	88	52	80	42	72	28	67	17	56	8	100
88	58	82	51	[illegible]	41	70	29	64	18	66	10	93
90	74	94	73	80	73	87	56	89	41	76	38	....
97	58	98	54	92	41	81	81	80	20	65	17	90.5
96	63	94	66	92	56	78	88	([1])	([1])	73	21	....
99	55	85	51	78	35	([1])	([1])	67	18	61	10	97
94	61	86	45	84	40	74	24	52	15	48	—16	132
100	51	88	41	83	40	74	24	61	17	46	—11	128
([1])	([1])	([1])	([1])	([1])	([1])	([1])	([1])	([1])	([1])	([1])	([1])	....
99	60	([1])	([1])	([1])	([1])	81	31	72	25	60	7	....
90	46	90	44	83	38	72	26	62	18	48	4	123
90	44	90	41	84	37	76	20	70	7	59	7	106
86	48	70	43	70	40	68	16	59	21	43	—6	107
95	57	93	56	90	40	88	28	80	21	70	16	....
([1])	([1])	([1])	([1])	([1])	([1])	78	27	63	20	48	—10	....
103	40	93	45	93	44	80	26	65	18	47	—7	130
([1])	([1])	([1])	([1])	([1])	([1])	([1])	([1])	([1])	([1])	([1])	([1])	....
93	30	81	29	79	22	63	7	42	—2	96	—33	135
93	51	96	47	([1])	([1])	([1])	([1])	([1])	([1])	([1])	([1])	....
90	52	88	43	82	37	70	30	68	23	54	9	89.5
93	50	86	42	76	36	76	22	56	5	48	—10	135
95	74	88	78	96	60	88	43	89	62	52	20	....
88	56	87	49	82	24	70	32	[illegible]	6	50	—2	108
92	50	84	38	[illegible]	34	77	23	54.9	14.6	51	—16	[illegible]
99	51	94	47	86	38	70	21	67	21	55	—2	116
([1])	([1])	88	46	([1])	([1])	([1])	([1])	([1])	([1])	([1])	([1])	....
90	52	90	46	80	40	75	22	67	15	53	7	101
84	57	85	53	80	51	75	45	72	43	68	41	58
89	54	84	44	78	34	70	23	59	14	56	2	[illegible]
96	[illegible]	102	63	97	56	94	53	74	42	75	27	....
92	56	([1])	([1])	([1])	([1])	75	36	67	14	51	—16	....
100	59	91	54	87	44	([1])	([1])	([1])	([1])	([1])	([1])	....
95	67.1	85	65	79	60	68	41	68	29	65	22	76.1
91	50	88	43	75	36	76	21	73	15	47	5	110
90	70	91	71	92	72	94	72	94	73	[illegible]	60	28
([1])	([1])	90	51	([1])	([1])	([1])	([1])	([1])	([1])	54	17	....
104	53	97	52	87	48	75	30	68	26	52	—2	136
97	60	92	45	([1])	([1])	80	20	([1])	([1])	50	—20	....
98	59	98	51	85	50	83	29	76	10	68	—3	109
85	40	90	41	86	32	83	19	58	20	65	6	[illegible]
98	67	96	66	90	59	83	40	84	25	78	21	97
96	47	90	52	83	40	78	28	73	26	66	—8	108
91	56	80	55	83	31	75	21	50	—6	44	—14	....
97	60	103	64	103	57	97	41	82	36	85	35	78
98	65	99	51	83	41	77	25	60	16	47	—5	137
101	54	100	54	100	52	([1])	([1])	([1])	([1])	69	38	....
90	46	84	30	78	32	70	27	62	[illegible]	56	4	101
96	54	90	40	88	40	80	33	[illegible]	24	59	[illegible]	....
([1])	([1])	([1])	([1])	([1])	([1])	([1])	([1])	([1])	([1])	([1])	([1])	....
96	62	95	55	([1])	([1])	81	30	76	20	76	—3	....
99	68	99	63	96	48	82	31	61	22	70	10	111
96	48	96	44	([1])	([1])	72	28	64	20	[illegible]	9	....
98	63	97	62	78	38	79	29	[illegible]	26	([1])	([1])	....
102	63	94	52	92	50	76	36	72	28	62	[illegible]	....
96	50	93	55	86	48	75	37	60	29	62	44	95

[1] No record.

Monthly maximum and minimum temperature and annual range

Stations.	January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
	°	°	°	°	°	°	°	°	°	°	°	°
Richardton, Dak	37	—36	40	—23	48	—6	70	26	80	20	83	40
Richmond, Ky	57.1	—5	62	—6	71	10	83	29	83	38	89	50
Riley, Ill	40	—26.4	40	—24	56	—4	74	23	85	29	86	42
Rock Creek Bridge, D. C	65	9	52	4	72	14	88	34	90	51	100	62
Rockford, Ill	44	—28	42	—25	54	—2	74	25	79	31	85	45
Round Grove, Iowa	46	—34	44	—26	57	zero	77	25	82	20	([1])	([1])
Rowe, Mass	48	—12	39	—12	51	—16	79	16	80	30.4	82	48
Ruggles, Ohio	48	—14	46	—15	53	—7	72	22	84	35	90	45
Sacramento, Cal	63	31	72	32	80	37	87	35	100	45	92	49
Salem, N. J	60	10	48	5	65	13	88	32	86	44	95	60
Salina, Kans	52	—21	45	—6	74	10	85	28	90	41	88	56
Salinas City, Cal	70	30	75	32	82	36	82	41	76	50	73	51
Sandwich, Ill	46	—31	46	—34	61	—3	78	26	84	33	90	40
San Rafael, Cal	62	30	73	30	80	32	83	32.8	90	37	84	36.5
Shirlock, Kans	53.3	—18.9	60	0.5	74	17	80	35	86	33	94	56
Snowville, Va	67	8	52	—2	64	13	82	29	82	32	85	50
Somerset, Mass	48	—4	52	—5	58	zero	85	28	89	32	96	50
Somerville, N. J	58	2.6	44	—2	58	6	87	31	86	39	91	56
South Bethlehem, Pa	50	—6	45	—6	57	2	90	24	80	30	96	41
South Evanston, Ill	([1])	([1])	44	—24	55	—2	78	21	82	29	89.8	39.4
Southington, Conn	59	—8	43	—3	58	zero	87	25	86	28	93	50
South Orange, N. J	62	zero	44	—2	62	8	86	26	88	40	92	56
Spiceland, Ind	49	—19	52	—14	64	—1	78	25	85	32	89	41
Springfield, Mo	62	—9	64	—13	76	11	81	30	83	40	([1])	([1])
Stateburg, S. C	72	20	64	16	67	26	85	34	88	48	93	56
Statesville, N. C	67	14	62	8	69	20	87	29	86	44	93	60
Sterling, Kans	55	—22	62	—12	82	14	83	28	84	33	97	53
Stockham, Nebr	50	zero	58	zero	70	38	76	44	84	40	92	64
Strafford, Vt	48	—18	40	—16	44	—18	80	14	82	26	86	48
Summit, Va	66	6	62	—2	72	8	88	25	88	33	97	46
Sunman, Ind	49	—18	58	—14	68	zero	80	28	90	34	94	48
Sussex, Wis	37	—25	39	—24	51	8	76	19	84	27	85	42
Swanwick, Ill	60	—14	67	—10	77	12	78	30	86	36	89	53
Swartz Creek, Mich	45	—27	42	—27	45	—13	80	19	81	24	87	39
Sycamore, Ill	41	—26	42	—27	54	—1	75	25	93	31	87	46
Tacoma, Wash	62	26	55	31	68	32	75	35	70	43	76	47
Tallahassee, Fla	71	26	([1])	([1])	79	34	83	45	88	63	([1])	([1])
Taunton, Mass	58	—3	52	1	57	4	84	27	88	32	91	41
Tecumseh, Nebr	50	—24	60	—24	66	13	76	25	83	29	99	50
Terre Haute, Ind	49	—17	51	—10	62	10	78	31	83	43	87	49
Thornville, Mich	40	—12	35	—22	49	—11	84.4	12	85	28	86	43
Tiffin, Ohio	45	—16	47	—18.5	58	—4	81	23	85	33	90	49
Topeka, Kans	65	—14	55	—18	77	14	78	32	88	39	96	55
Traverse City, Mich	35	—25	44	—25	46	—24	78	11	82	20	93	38
Troy, Pa	54	16	42	—18	57	—8	85	20	88	25	90	37
Variety Mills, Va	62	5	60.7	2	71	9	86	23	84	33	([1])	([1])
Vermillion, Dak	46	—33	69	—24	64	zero	76	17	85	25	90	40
Vevay, Ind	52	—10	59	—9	75	8	85	30	87	36	93	52
Vineland, N. J	67	5	54	1	64	7	84	27	85	41	97	51
Voluntown, Conn	55	zero	44	—2	([1])	([1])	76	26	84	36	88	53
Wabash, Ind	48	—21.2	60	—15	60	2	75	27	82	37	88	42
Washington City	([1])	([1])	([1])	([1])	([1])	([1])	([1])	([1])	92.5	42	95	([1])
Washington, Pa	48	4	50	—8	59	6	84	25	87	43	([1])	([1])
Waterville, Me	43	—16	47	—30	56	—16	84	20	86	25	92	42
Wausau, Wis	36	—36	44	—29	47	—17	76	12	84	23	87	32
Wauseon, Ohio	47.6	—29.4	51	—24	56	—7	82	12	83	21	90	38
Webster, Dak	55	—33	62	—38	70	—24	79	20	91	8	94	29
Weldon, N. C	72	15	62	10	70	10	87	34	86	48	90	62
Wellington, Kans	51	—10	54	—6	80	18	85	29	88	32	95	53
Wellsborough, Pa	52	—12	44	—22	52	—12	81	18	85	30	85	30
Westborough, Mass	60	—8	53	—2	60	zero	85	25	89	25	96	40
West Chester, Pa	62	1	52	—3	62	4	85	26	84	34	92	48
Westerville, Ohio	54	—13	52	—18	60	—0.5	82	22	83	32	88	43
West Leavenworth, Kans	64	—10	64	—16	72	16	77	28	88	38	94	52
Westmoreland, Kans	([1])	([1])	([1])	([1])	([1])	([1])	79	26	82	26	100	46
West Union, Iowa	35	—32	40	—28	51	—11	71	21	82	26	86	40
White Plains, N. Y	60	—2	42	—1	53	1	78	24	80	32	85	55
Wilkesbarre, Pa	56	—8	45	—12	57	—3	89	21.2	89	31	91	40
Williamstown, Mass	56	—10	38	—10	48	—14	81	20	80	27	83	40
Wilton Centre, Ill	48	—32	46	—32	63	—4	80	19	92	29	93	36
Woodstock, Md	60	—1	48	—3	67	6	84	27	81	33	93	46
Woodstock, Vt	52	—29	41.4	—38	52	—27	86	15	86	21	93	36
Worcester, Mass	54	—4	39	—3	51	1	78	25	77	36	84	46
Wyandotte, Kans	52	—9	52	—14	72	16	74	30	87	38	91	53
Wysox, Pa	([1])	([1])	([1])	([1])	([1])	([1])	84	24	80	32	86	42
Wytheville, Va	65	3	65	—4.5	65	10	79	27	81	38	87	43
Yates Centre, Kans	51	11	55	—10	77	14	78	31	87	34	90	53
Yellow Springs, Ohio	([1])	([1])	([1])	([1])	62	—1	80	28	92	33	89	47
Yutan, Nebr	56	—26	52	—18	68	—11	79	31	86	38	92	53

[1]No record.

of temperature (in degrees Fahrenheit), &c.—Continued.

July.		August.		September.		October.		November.		December.		Annual range.
Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	
°	°	°	°	°	°	°	°	°	°	°	°	°
95	46	94	42	97	34	79	22	56	10	59	—10	133
(1)	(1)	94	48	86	30	75	29	71	26	60	6	....
92	48	84	45.7	80	36	69	24	60	23	42	—12	118.4
101	61	97	56	92	51	78	39	74	31	64	16	97
91	55	84	48	79	41	70	25	59	19	43	—10	119
94	50	86	50	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	....
86	48	84	46	77	34	70	20	62	13	(1)	(1)	....
94	52	88	48	80	40	(1)	(1)	66	14	51	—2	109
97	49	102	50	93	43	90	37	74	36	67	34	71
101	65	94	56	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	....
88	62	84	67	78	53	71	39	53	31.2	53	14	111
76	54	76	52	95	46	72	38.3	72	30	74	32	65
97	62	87	50	83	43	74	29	66	20	46	—14	113
94	41	(1)	(1)	97	41	94	34	78	14	73	31	....
96	62	(1)	(1)	(1)	(1)	82	29	78	19	71	3	....
(1)	(1)	88	40	80	43	70	28	70	22	62	22	....
104	44	94	44	88	39	76	32	68	20	67	7	109
96	61	91	54	85	42	75	33	68	24	54	10	98
103	46	94	46	89	40	82	30	71	16	(1)	(1)	....
97	42	(1)	(1)	85	38	70	29	65	20	46	—18	....
95	53	(1)	(1)	83	38	73	27	70	11	57	6	....
96	56	88	54	85	44	76	34	76	30	60	14	98
96	47	94	46	83	37	73	29	68	19	54	—3	115
94	50	92	53	83	47	80	25	79	22	62	zero	....
98	59	93	64	88	52	77	40	76	31	66	24	77
93	60	93	55	90	44	73	33	71	31	62	24	85
99	60	97	54	89	50	85	29	76	22	65	—6	121
100	70	96	64	92	58	84	42	72	38	68	20	100
88	52	86	42	78	36	70	24	56	8	50	zero	106
100	50	99	46	95	35	79	30	73	24	62	9	102
96	50	94	48	84	36	76	26	67	20	51	—2	114
100	51	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	
(1)	(1)	96	53	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	
92	44	(1)	(1)	82	36	74	13	66	23	50	—6	
94	53	86	47	86	35	72	25	62	21	42	—10	121
86	51	84	52	75	46	64	39	60	34	60	28	69
92	74	92	78	88	63	83	46	77	30	72	26	....
94	50	90	48	87	34	75	29	71	19	61	9	97
102	58	96	52	92	44	82	25	72	16	56	— 3	126
94	54	90	52	80	42	72	34	67	28	58	2	111
94	55	86	44	85	41	76	24	68	28	49	— 2	116
95	53	94	50	84	41	78	30	69	23	54	— 2	113.5
100	61	99	57	94	51	88	26	78	19	71	— 3	118
92	44	87	48	85	36	75	18	55	23	43	2	118
96	40	94	36	83	33	80	27	65	5	49	— 1	114
(1)	(1)	(1)	(1)	(1)	(1)	73	28	69	19	60	11.4	....
99	46	95	39	91	32	84	23	72	13	58	—14	132
100	50	96	51	85	43	78	32	71	25	62	7	110
100	58	92	58	98	54	(1)	(1)	(1)	(1)	(1)	(1)	....
82	62	90	50	84	36	72	30	70	14	60	4	....
95	58	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	....
96	57	(1)	(1)	90	44	77	37	70	28	(1)	(1)	....
(1)	(1)	(1)	(1)	(1)	(1)	75	28	68	16	(1)	(1)	....
(1)	(1)	(1)	(1)	87	36	84	25	61	15	56	2	....
90	42	80	36	85	28	73	13	46	8	48	—22	126
98	46	91	40	87	31	78	14	69	16	54	— 7	127.4
99	46	99	44	98	27	83	21	52	16	56	—12	137
100	62	98	58	93	44	78	37	80	29	68	22	90
102	64	101	49	93	49	81	25	78	20	69	— 9	112
96	54	90	40	84	38	78	28	70	22	48	— 2	118
96	45	90	40	85	34	78	28	72	12	64	9	104
98	53	89	47	84	42	75	33	68	26	59	9	101
95	44	90	46	80	30	74	23	68	21	58	1	113
90	61	97	52	85	49	79	31	76	25	57	6	115
(1)	(1)	101	47	96	45	87	24	70	20	58	— 4	....
95	52	86	45	83	39	73	20	56	17	46	—10	127
88	59	84	54	78	38	72	33	68	20	55	7	90
97	42	93	41	86	38	83	30	72	12	56	5	109
87	43	89	34	76	37	72	26	67	10	59	5	103
103	39	96	42	90	35	(1)	(1)	(1)	(1)	(1)	(1)	....
98	50	91	45	84	37	72	30	78	23	60	6	101
93	44	87.8	34	82	32	75	22	62	—10	(1)	(1)	....
87	53	82	45	77	38	70	30	65	12	58	7	91
100	60	94	53	88	48	78	28	74	21	56	— 2	114
91	52	88	48.8	82	40	77	28	66	13	56	zero	....
90	43	87	40	82	35	70	31	68	24	65	14	94.5
96	59	92	52	84	49	82	26	79	20	60	— 2	106
98	54	92	45	88	37	74	21.8	69	23	56	— 0.4	....
100	60	(1)	(1)	(1)	(1)	80	31	68	20	59	— 8	....

[1] No record.

APPENDIX 35.

Monthly maximum and minimum temperatures and annual range of temperature (in

[From self-register

Stations.	January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Mix.	Max.	Min.	Max.	Min.
	°	°	°	°	°	°	°	°	°	°	°	°
Abraham Lincoln, Fort, Dak	38	—42	42	—35	49	—15	74	16	84	22	90	46
Alcatraz Island, Cal	58	40	69	45	75	43	74	36	72	47	67	48
Angel Island, Cal	69	42	82	44	91	48	66	46	81	48	88	51
Assinaboine, Fort, Mont	45	—45	51	—24	70	9	80	11	87	11	95	33
Barrancas, Fort, Fla	80	20	75	23	79	31	67	41	91	48	99	65
Benicia Barracks, Cal	57	38	69	41	76	47	82	45	92	53	82	53
Bidwell, Fort, Cal	57	2	66	21	75	20	75	31	(1)	(1)	(1)	(1)
Brady, Fort, Mich	36	—41	41	—39	39	—27	70	— 5	84	20	84	23
Bridger, Fort, Wyo	50	—14	50	5	60	10	62	20	75	22	80	20
Brown, Fort, Tex	80	29	84	36	85	47	87	57	94	63	95	70
Buford, Fort, Dak	46	—50	44	—32	60	1	(1)	(1)	(1)	(1)	(1)	(1)
Columbus, Fort, N. Y. H	61	5	44	Zero.	56	7	79	27	83	39	91	52
Concho, Fort, Tex	74	— 2	79	15	83	30	93	42	93	45	107	62
David's Island, N. Y	63	5	52	— 3	53	5	79	21	82	37	90	55
Ellis, Fort, Mont	48	—25	55	—20	64	10	72	18	83	18	91	32
Fred Steele, Fort, Wyo	47	—21	47	—14	62	— 5	72	10	79	28	87	29
Gaston, Fort, Cal	70	28	70	33	82	32	89	35	98	38	91	40
Hamilton, Fort, N. Y	58	3	48	— 2	53	5	78	22	83	36	92	50
Keogh, Fort, Mont	44	—50	50	—28	64	2	80	21	88	17	97	35
Klamath, Fort, Oreg	47	4	72	8	69	17	76	13	85	19	85	27
Lewis, Fort, Colo	50	—14	54	Zero.	54	13	68	16	77	31	79	20
Lyon, Fort, Colo	65	—24	68	— 5	75	17	84	24	96	33	97	46
Madison Barracks, N. Y	52	—30	40	—21	46	—21	77	16	83	29	86	39
Mason, Fort, Cal	64	43	67	47	75	49	76	50	76	51	81	51
McDermit, Fort, Nev	40	8	54	19	70	24	80	20	88	27	91	31
McDowell, Fort, Ariz	77	16	81	20	88	36	98	31	110	40	108	53
McHenry, Fort, Md	62	8	45	1	64	10	78	30	80	42	91	55
Meade, Fort, Dak	(1)	(1)	65	—19	64	— 1	78	25	82	20	84	37
Mojave, Fort, Ariz	73	30	81	33	86	36	97	56	107	(1)	108	71
Monroe, Fort, Va	67	16	62	10	66	18	76	33	83	46	92	57
Mount Vernon, Barracks, Ala	76	16	81	15	80	25	91	34	91	46	98	50
Niagara, Fort, N. Y	52	— 3	40	—12	48	— 3	78	18	78	29	82	44
Pembina, Fort, Dak	39	—46	40	—34	41	—25	68	—12	84	22	89	34
Plattsburg Barracks, N. Y	52	—17	35	—27	46	—22	82	14	81	28	80	42
Preble, Fort, Me	49	—10	39	—16	49	7	60	28	72	36	81	50
Presidio of San Francisco, Cal	67	37	73	30	78	43	78	39	78	43	67	44
Randall, Fort, Dak	52	—33	56	—25	68	Zero.	81	18	90	25	98	38
Reno, Fort, Ind. T	62	— 5	70	Zero.	81	20	88	33	87	37	93	50
Robinson, Fort, Nebr	55	—25	55	—24	69	Zero.	77	22	86	18	89	35
Saint Augustine, Fla	79	35	77	34	82	34	87	47	88	55	94	69
Shaw, Fort, Mont	48	—29	56	—30	71	9	77	17	85	22	91	35
Sisseton, Fort, Dak	40	—37	41	—36	40	—16	69	11	81	20	85	32
Snelling, Fort, Minn	42	—43	42	—31	50	— 7	74	16	86	25	87	33
Sully, Fort, Dak	56	—34	57	—26	67	8	81	23	89	27	95	38
Totten, Fort, Dak	35	—40	37	—35	39	—20	74	5	86	20	88	35
Townsend, Fort, Wash	62	26	62	38	66	39	73	40	79	28	78	44
Union, Fort, N. Mex	65	—24	65	— 6	60	7	75	24	82	32	87	37
West Point, N. Y	60	—10	(1)	(1)	53	— 5	(1)	(1)	(1)	(1)	92	45
Wingate, Fort, N. Mex	49	— 6	(1)	(1)	(1)	(1)	(1)	(1)	84	32	88	41
Yates, Fort, Dak	45	—34	49	—32	56	—10	76	20	89	24	93	33

[1] No record.

APPENDIX 35.

degrees Fahrenheit) at military-post hospitals for the year ending December 31, 1885.
ing thermometers.]

July.		August.		September.		October.		November.		December.		Annual range.
Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	
°	°	°	°	°	°	°	°	°	°	°	°	°
100	50	96	38	100	30	84	13	55	8	57	-11	142
70	48	70	49	78	50	69	50	66	49	66	44	42
93	49	84	50	96	52	86	51	73	42	76	43	54
98	37	99	37	96	29	85	14	72	11	07	-18	144
(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	....
94	57	98	53	92	55	92	53	75	45	63	43	60
92	50	94	53	88	33	86	27	74	20	60	15	....
88	41	82	42	83	34	67	12	53	20	42	-15	129
90	34	92	36	80	29	74	16	56	-6	55	-3	106
96	71	96	70	94	68	93	55	88	40	(1)	(1)	....
(1)	(1)	91	38	98	30	(1)	(1)	(1)	(1)	(1)	(1)	....
95	57	89	51	85	44	75	33	68	26	59	14	95
106	65	105	62	96	53	94	37	88	25	81	15	109
97	60	90	47	84	42	77	35	66	24	56	11	100
97	38	95	33	91	22	82	22	70	6	58	-15	122
94	40	92	33	87	31	75	11	64	4	56	-20	115
106	45	108	45	96	40	91	28	70	30	69	28	80
(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	....
104	48	98	39	99	31	86	12	67	3	69	-15	154
96	29	96	37	90	20	91	16	57	11	52	14	92
89	41	89	40	82	30	75	17	63	12	57	-2	103
105	54	102	54	96	38	85	24	80	20	75	-6	120
90	44	85	40	78	28	72	17	71	5	54	3	120
74	53	80	50	77	51	71	51	65	48	64	43	38
94	47	102	46	92	35	86	26	65	18	56	5	97
114	70	116	67	111	52	104	30	94	34	83	20	100
97	60	91	52	84	47	74	38	70	33	62	15	96
99	45	95	40	94	87	81	22	66	20	69	-2	....
115	58	115	53	112	59	103	42	85	41	76	32	85
95	56	93	62	86	48	80	41	78	35	65	21	85
98	59	99	61	93	54	85	35	80	26	72	27	84
88	48	86	50	82	40	75	31	63	25	52	7	100
94	38	90	27	83	25	73	18	44	8	40	-24	140
95	50	83	43	81	37	67	24	62	8	51	1	122
86	57	79	53	79	41	65	36	57	20	54	10	102
78	48	83	48	88	47	74	46	(1)	(1)	66	39	....
107	43	91	39	93	33	83	20	66	9	61	-15	140
98	61	99	53	92	52	88	28	85	21	72	-2	104
100	50	96	38	96	35	88	9	74	11	74	-18	125
92	71	93	70	89	67	84	54	82	33	74	28	66
95	38	97	39	91	32	75	21	64	9	65	-1	126
92	40	89	33	96	27	80	12	50	5	50	-19	133
94	52	87	38	88	33	81	22	55	11	52	-21	137
104	45	99	46	97	37	86	21	55	13	63	-8	138
92	41	88	37	97	29	80	22	45	4	41	-22	137
86	46	85	46	75	42	69	30	62	32	60	25	61
91	48	94	44	82	39	82	11	75	10	65	-9	118
109	50	91	40	86	40	73	23	70	16	57	5	....
96	49	93	46	88	38	80	24	70	18	62	8	....
97	38	97	41	98	30	87	8	58	8	56	-15	132

[1] No record.

APPENDIX 36.

Monthly and annual mean temperature (in degrees Fahrenheit) at military post hospitals for the year ending December 31, 1885.

[The daily mean is obtained by dividing the sum of the 7 a. m., 2, and twice the 9 p. m. (local time) observations by 4; the monthly by dividing the sum of the daily by the number of days in the month.]

Stations.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
	°	°	°	°	°	°	°	°	°	°	°	°	°
Abraham Lincoln, Fort, Dak.	—3.4	—0.9	23.4	[illegible]	56.6	65.6	72.1	63.9	56.3	42.6	30.0	22.7	39.6
Alcatraz Island, Cal	49.0	53.2	54.7	56.4	56.2	56.6	57.8	55.9	56.6	56.6	54.7	56.4	55.6
Angel Island, Cal	50.9	55.0	59.2	59.4	60.1	61.7	61.0	60.1	62.0	60.3	55.7	[illegible]	[illegible]
Assinaboine, Fort, Mont	11.1	16.7	40.1	46.2	57.4	64.3	67.5	66.1	58.2	46.7	39.2	21.5	45.4
Barrancas, Fort, Fla	53.5	52.6	57.0	68.3	74.9	82.9	(1)	(1)	(1)	(1)	(1)	(1)	.....
Benicia Barracks, Cal	47.2	54.3	57.7	56.8	62.5	63.0	66.4	67.8	68.9	62.3	56.0	50.6	58.7
Bidwell, Fort, Cal	32.9	40.0	46.6	51.4	(1)	(1)	70.6	72.1	63.3	57.6	41.2	37.6	.....
Brady, Fort, Mich	6.4	4.4	7.3	33.4	50.0	58.8	[illegible]	56.8	55.4	42.3	34.0	22.1	36.7
Bridger, Fort, Wyo	21.2	27.5	34.4	41.4	46.7	55.6	67.7	63.0	[illegible]	44.3	33.4	26.8	43.0
Brown, Fort, Tex	53.4	58.6	66.1	75.6	77.9	83.3	75.0	82.2	81.1	74.3	70.0	(1)	....
Buford, Fort, Dak	—2.0	3.0	29.8	(1)	(1)	(1)	(1)	63.5	56.3	(1)	(1)	(1)	..
Columbus, Fort, N. Y. H	28.9	23.1	[illegible]	47.5	56.5	68.5	74.8	71.7	64.5	54.5	44.6	35.5	50.0
Concho, Fort, Tex	37.2	45.7	65.5	67.8	71.1	84.0	84.0	85.5	77.1	66.9	57.8	51.9	65.5
David's Island, N. Y.	31.6	23.5	28.9	46.5	55.0	67.6	73.8	70.2	63.7	54.2	45.2	32.4	49.4
Ellis, Fort, Mont	18.9	24.2	34.2	42.6	50.5	56.4	65.9	62.2	54.4	45.8	38.0	31.1	42.8
Fred Steele, Fort, Wyo	20.0	24.2	32.6	43.8	50.0	62.2	69.7	[illegible]	57.1	44.3	35.0	28.0	44.1
Gaston, Fort, Cal	45.3	50.9	55.3	57.8	63.4	63.4	73.1	72.6	65.7	60.9	47.0	47.6	58.5
Hamilton, Fort, N. Y	29.8	22.9	[illegible]	47.0	56.5	67.4	(1)	(1)	(1)	(1)	(1)	(1)	.....
Keogh, Fort, Mont	8.2	17.3	37.8	47.1	57.9	66.6	73.1	67.0	58.2	47.6	38.9	29.6	45.8
Klamath, Fort, Oreg	28.8	35.5	41.8	45.0	52.1	54.9	[illegible]	62.7	52.2	47.5	36.6	34.8	44.2
Lewis, Fort, Colo	17.6	26.7	34.0	40.0	48.0	55.9	65.8	64.1	55.4	47.9	34.7	29.4	42.4
Lyon, Fort, Colo	17.0	29.3	[illegible]	57.1	60.9	74.6	79.2	76.6	67.6	51.9	43.1	34.5	52.9
Madison Barracks, N. Y	10.6	10.6	18.0	38.8	54.5	61.7	69.8	63.8	56.6	47.7	33.8	26.2	42.3
..	53.2	55.6	56.6	59.6	62.8	61.8	60.6	58.9	59.9	58.6	55.5	55.1	58.3
..	37.6	35.8	44.3	48.2	55.1	60.3	72.6	72.9	62.2	56.3	38.7	34.6	50.5
..	47.0	52.2	62.2	67.2	75.1	83.3	92.9	91.7	84.0	72.3	60.3	52.8	70.1
..	30.7	24.6	32.4	52.2	62.3	70.6	77.8	72.9	64.8	57.6	47.9	38.4	53.7
..	(1)	12.2	31.9	46.4	54.2	62.2	71.2	65.1	60.7	48.3	40.2	23.3	.....
..	44.7	58.5	66.8	73.7	82.9	86.1	94.8	94.8	85.3	72.4	61.6	55.8	72.3
..	40.6	35.3	39.4	54.2	63.7	[illegible]	70.9	77.8	70.2	60.2	50.8	42.2	57.3
la	49.6	49.8	55.5	60.2	73.5	81.2	81.6	80.9	77.6	64.1	57.4	50.5	63.9
..	21.0	12.6	21.5	39.0	50.7	62.7	70.7	65.9	60.2	49.4	41.6	30.1	42.9
..	—10.6	9.1	14.4	37.2	51.3	61.3	65.1	59.9	53.7	38.6	26.0	9.6	34.7
..	16.5	7.2	16.6	40.1	54.8	[illegible]	69.1	64.8	56.5	46.0	35.8	21.8	41.0
..	21.6	17.7	23.8	42.0	53.9	65.6	70.6	63.5	58.0	50.2	40.7	29.2	44.0
al	49.7	53.5	55.1	56.5	56.6	56.6	59.5	57.5	[illegible]	57.8	(1)	52.9	....
..	9.4	13.5	34.6	50.1	59.9	[illegible]	76.5	67.9	63.8	48.4	36.8	28.4	44.0
..	25.8	33.0	47.4	60.8	64.0	75.0	81.2	77.8	71.7	57.5	51.6	41.2	57.2
..	19.4	22.6	37.8	47.0	55.9	66.2	73.6	70.7	62.7	49.4	40.7	30.7	48.3
..	58.6	55.0	58.0	68.0	73.8	79.4	[illegible]	79.4	79.2	69.9	61.2	52.5	70.3
..	17.6	24.2	41.3	44.8	54.0	60.8	64.3	63.1	56.8	47.3	42.0	30.3	45.9
..	2.7	1.4	22.7	41.9	53.1	63.2	69.6	62.3	58.2	42.6	23.4	18.7	36.7
..	—0.5	4.6	24.2	43.5	57.4	67.4	72.7	65.1	59.7	43.8	34.0	21.8	41.1
..	5.6	10.6	34.0	49.0	58.4	67.7	75.9	67.6	62.7	47.7	32.5	25.2	45.1
..	—6.4	—3.3	18.7	39.5	52.9	61.8	67.2	61.6	56.4	40.5	26.4	14.1	35.8
..	42.6	47.0	50.7	51.8	56.8	60.3	65.3	63.0	58.8	52.5	48.2	44.3	53.4
..	29.2	33.5	39.1	46.1	52.4	64.8	70.0	67.4	63.2	52.0	42.9	35.6	49.7
..	27.9	(1)	24.7	(1)	(1)	68.7	75.0	69.8	63.9	53.6	41.7	32.9	.....
..	28.5	(1)	(1)	(1)	57.2	64.5	70.4	67.8	62.0	51.5	40.5	34.6	.....
..	2.2	4.1	27.8	45.6	58.2	68.1	72.9	65.6	60.0	43.9	31.6	23.1	41.8

[1] No record.

APPENDIX 37.

Monthly and annual mean temperatures (in degrees Fahrenheit) at stations on the Central Pacific and Southern Pacific Railroads and connecting branches, for the year ending December 31, 1885.

[The daily mean is obtained by dividing the sum of the maximum and minimum temperatures by 2; the monthly, by dividing the sum of the daily by the number of days in the month.]

Stations.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
	°	°	°	°	°	°	°	°	°	°	°	°	°
Alta, Cal	42.6	47.7	54.4	49.8	63.0	62.3	(1)	(1)	(2)	.....	.....	.....	.....
Anaheim, Cal	54.9	59.3	68.0	68.3	68.0	72.6	73.9	75.9	72.8	66.8	62.7	58.9	66.8
Antioch, Cal	43.9	53.2	58.2	62.1	68.9	68.4	74.5	75.7	73.7	67.0	52.0	(1)	.....
Aptos, Cal	49.2	51.1	55.4	57.7	61.7	65.4	64.9	63.5	60.2	59.3	56.0	53.7	58.2
Auburn, Cal	44.6	51.3	56.3	56.9	64.6	66.3	73.8	78.1	72.3	64.5	52.5	46.8	60.7
Battle Mountain, Nev	30.9	40.3	45.8	51.3	58.6	66.1	77.3	74.7	66.3	52.8	43.2	35.5	53.5
Benson, Ariz	45.2	51.8	59.4	65.4	76.3	83.2	87.7	83.0	78.1	67.6	59.4	50.4	67.3
Beowawe, Nev	30.0	39.4	47.2	52.1	59.5	64.3	78.2	73.9	63.0	53.9	43.7	36.1	53.4
Bishop Creek, Cal	42.4	50.0	59.1	63.7	75.0	77.2	89.0	86.2	76.4	65.3	48.6	44.1	64.8
Blue Creek, Utah	24.3	33.8	45.2	55.7	61.8	68.8	84.6	79.8	69.5	56.0	42.1	29.7	54.3
Boca, Cal	30.2	33.8	46.9	44.6	52.4	53.5	62.9	64.2	58.7	(1)	40.5	33.1	.....
Borden, Cal	45.6	53.1	59.0	59.0	68.1	74.1	86.4	88.8	79.6	75.9	54.6	49.3	66.1
Brentwood, Cal	47.2	56.5	61.7	62.7	70.7	73.2	77.6	77.5	75.7	69.1	60.8	(1)	....
Brighton, Cal	47.2	53.8	61.1	62.7	69.4	70.1	74.5	78.1	78.2	69.8	60.7	55.3	65.1
Brown, Nev	34.0	43.2	51.4	58.8	68.2	74.5	86.2	81.3	70.5	58.0	45.6	39.8	59.3
Byron, Cal	47.0	55.7	60.9	62.4	71.9	74.5	83.2	82.8	78.1	67.3	55.8	(1)	.....
Cabazon, Cal	50.8	57.6	62.3	61.7	69.9	73.0	83.8	86.3	79.4	(1)	(1)	(1)	.....
Caliente, Cal	47.7	58.9	61.7	61.4	69.9	74.1	79.0	88.2	74.8	66.8	58.3	48.4	65.8
Calistoga, Cal	48.0	51.1	58.3	62.2	68.3	68.6	69.4	72.5	67.0	60.1	54.8	52.3	61.0
Carlin, Nev	24.6	33.9	40.6	46.9	54.4	60.6	72.1	72.6	59.5	46.0	40.8	33.3	48.8
Casa Grande, Ariz	49.5	56.0	67.1	71.5	80.2	91.5	94.7	94.6	88.9	78.3	67.9	56.0	74.7
Chico, Cal	49.4	54.5	63.9	65.1	73.9	76.5	84.4	(1)	76.1	70.8	54.9	51.4	.....
Chualar, Cal	50.4	50.6	55.6	56.0	55.4	58.8	63.9	65.2	64.0	61.6	57.0	(1)	.....
Cisco, Cal	30.6	(1)	42.3	42.5	51.5	51.3	64.5	67.2	59.3	57.8	34.7	35.3	.....
Colfax, Cal	46.3	51.0	55.0	54.1	64.9	68.6	75.4	78.2	(1)	63.2	48.4	49.7	.....
Colton, Cal	52.2	54.9	59.0	62.4	67.4	76.4	82.0	87.4	79.3	70.9	63.7	50.1	67.1
Corinne, Utah	25.0	35.9	45.8	56.1	63.0	70.0	80.6	74.3	65.2	50.2	39.5	31.3	53.1
Davisville, Cal	(1)	54.9	59.9	61.9	70.0	72.6	76.0	80.1	78.4	69.2	57.4	51.8	.....
Delano, Cal	53.2	56.9	63.0	65.8	71.9	77.9	84.2	89.2	79.6	68.5	(1)	51.0	.....
Delta, Cal	43.0	46.8	53.9	57.0	67.6	67.4	78.4	76.9	(1)	(1)	48.5	41.7	.....
Deming, N. Mex	44.5	48.5	60.1	69.6	76.7	(1)	88.7	87.0	81.2	72.4	57.2	48.1	.....
Dunnigan, Cal	47.0	55.0	62.3	65.8	73.9	74.7	81.3	84.6	79.5	68.4	54.3	47.2	66.2
Elko, Nev	27.4	35.4	39.2	43.2	55.8	59.8	69.9	68.3	60.1	47.0	38.8	31.7	48.0
El Paso, Tex	41.9	48.5	54.5	66.3	73.3	85.2	88.8	85.4	81.0	69.1	55.7	48.4	66.5
Emigrant Gap, Cal	36.5	39.8	46.6	44.5	53.6	54.1	67.2	69.2	62.2	56.2	39.5	41.0	50.9
Farmington, Cal	45.2	55.7	61.6	63.4	67.1	69.1	80.5	82.6	76.2	69.1	56.0	52.1	64.9
Fresno City, Cal	53.1	53.5	58.3	64.5	73.2	78.2	88.2	88.3	(1)	66.7	59.0	52.1	.....
Galt, Cal	46.9	52.8	59.4	64.2	72.5	72.5	78.4	80.5	73.6	67.4	54.9	54.6	64.8
Gilroy, Cal	50.0	52.5	58.6	59.5	65.1	65.1	69.0	69.6	68.4	63.4	55.0	50.8	60.6
Golconda, Nev	39.1	47.2	54.2	60.4	67.2	70.2	81.2	81.4	72.0	62.8	48.9	45.9	60.8
Goshen, Cal	47.1	52.2	58.6	64.8	73.5	78.1	82.0	88.5	81.0	71.8	54.3	50.1	66.8
Halleck, Nev	26.0	41.3	46.2	50.2	60.0	70.1	73.9	76.3	63.2	46.1	42.0	31.4	52.6
Hawthorne, Nev	37.4	43.6	48.6	52.3	60.1	64.9	80.6	81.3	70.9	58.8	45.5	39.2	56.9
Hollister, Cal	52.4	55.9	59.3	60.7	66.2	66.0	68.8	67.4	68.2	64.8	58.0	55.7	62.0
Hotel del Monte, Cal	49.9	52.5	56.0	58.4	59.4	59.4	62.5	60.3	59.1	58.1	56.5	54.0	57.2
Hot Springs, Nev	36.1	43.9	51.6	55.1	62.8	69.8	76.7	78.5	68.2	53.8	45.4	41.8	57.0
Humboldt, Nev	33.8	40.6	40.2	52.7	62.8	66.0	73.4	72.1	66.8	52.3	45.9	40.8	53.9
Indio, Cal	52.3	61.4	64.1	73.4	83.6	88.0	92.7	94.7	88.6	79.2	64.3	57.6	74.6
Ione, Cal	48.0	52.9	58.2	61.0	65.9	67.1	78.2	80.7	73.9	62.7	57.6	49.5	63.0
Keeler, Cal	(1)	52.5	58.3	63.1	74.1	76.9	86.5	85.4	78.0	68.3	(1)	(1)	.....
Keene, Cal	45.9	45.1	53.2	54.9	62.3	64.6	74.5	77.8	71.5	63.3	54.2	52.6	60.0
Kelton, Utah	24.4	38.6	45.3	55.6	62.4	67.8	75.7	(1)	63.3	47.3	40.8	33.3	.....

[1] No record. [2] Discontinued.

Monthly and annual mean temperatures (in degrees Fahrenheit) at stations on the Central Pacific and Southern Pacific Railroads, &c.—Continued.

Stations.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
	°	°	°	°	°	°	°	°	°	°	°	°	°
Kingsburg, Cal	51.6	56.8	59.4	61.5	71.5	73.4	81.4	84.5	77.9	65.6	54.1	48.0	65.5
Knight's Landing, Cal	50.7	52.6	58.7	63.9	67.3	69.7	77.5	81.7	73.2	68.2	58.6	57.1	64.9
Lathrop, Cal	46.5	53.5	58.2	61.4	65.7	66.1	71.2	75.2	73.0	63.2	55.3	50.2	61.6
Lemoore, Cal	46.7	50.8	59.3	63.6	72.4	71.8	81.1	83.5	76.9	([1])	54.6	51.0	.....
Livermore, Cal	54.4	55.5	55.9	56.4	59.2	57.1	([1])	65.7	64.6	60.5	54.4	51.2	.....
Lordsburg, N. Mex	39.3	45.2	54.4	64.4	74.7	84.1	85.6	83.0	76.8	64.8	52.9	40.5	63.8
Los Angeles, Cal	60.3	60.6	65.3	66.6	68.0	70.6	75.1	76.4	74.5	66.0	64.0	60.7	67.3
Mammoth Tank, Cal	54.5	64.4	67.0	76.8	85.0	90.2	98.6	98.2	90.5	82.1	68.6	61.3	78.1
Maricopa, Ariz	52.4	56.5	64.7	70.3	83.0	90.5	93.2	92.5	86.7	75.7	64.1	54.0	73.6
Martinez, Cal	46.8	50.4	56.0	59.3	65.4	64.2	68.2	68.1	67.5	61.4	55.8	52.6	59.6
Marysville, Cal	([1])	56.8	64.9	66.6	73.8	71.5	82.1	80.9	([1])	66.8	55.8	([1])	.....
Menlo Park, Cal	47.8	51.6	55.3	58.5	62.4	63.4	68.0	66.3	64.4	58.6	54.2	49.2	58.3
Merced, Cal	50.7	55.3	64.7	64.6	72.7	73.8	81.6	82.9	75.5	70.8	59.8	51.5	67.0
Modesto, Cal	47.9	54.4	59.7	63.4	76.8	78.9	80.8	82.2	72.1	67.4	56.0	51.3	65.9
Mojave, Cal	43.6	52.6	58.7	59.3	68.6	73.2	83.4	85.9	76.3	64.7	52.7	48.0	63.5
Monterey, Cal	50.5	53.5	55.9	59.0	60.9	60.2	60.9	62.0	59.9	57.8	56.6	53.5	57.6
Napa City, Cal	46.5	51.1	58.1	59.4	66.6	65.4	69.1	68.2	68.5	62.0	51.1	48.9	59.6
Newhall, Cal	46.7	50.7	57.1	60.2	62.3	68.1	75.2	79.8	72.9	64.5	55.5	56.3	62.4
Niles, Cal	48.1	53.2	57.4	61.9	63.4	63.3	68.9	68.9	70.0	61.0	55.0	49.0	60.0
Oakland, Cal	49.8	53.4	56.0	57.8	58.4	58.4	62.6	63.3	61.3	58.1	57.2	51.9	57.4
Ogden City, Utah	25.8	37.1	45.0	56.3	62.5	71.0	79.8	77.1	66.2	51.6	43.1	33.6	54.1
Orland, Cal	52.2	57.4	66.0	66.8	75.7	75.7	83.7	87.4	79.6	72.1	56.6	53.6	68.9
Pajaro, Cal	49.8	50.9	56.0	58.0	60.3	59.9	64.4	62.5	61.3	59.4	56.4	54.8	57.8
Palisade, Nev	23.8	37.2	41.9	52.2	58.6	62.8	76.4	74.4	62.0	51.3	40.6	31.4	51.0
Pantano, Ariz	50.7	58.4	60.3	66.0	75.8	80.3	84.7	84.2	81.2	73.3	63.2	53.3	68.9
Petaluma, Cal	50.4	56.0	59.0	60.1	62.8	61.8	69.2	68.5	([1])	62.7	55.8	53.0	.....
Pleasanton, Cal	49.2	55.0	58.7	62.8	67.1	57.1	73.3	([1])	76.6	([1])	57.0	51.7	.....
Promontory, Utah	15.7	38.1	44.3	55.3	62.9	70.7	79.0	78.5	67.5	56.2	44.2	32.6	53.8
Ravenna, Cal	45.1	48.1	54.5	59.8	65.7	67.1	74.4	79.0	72.3	62.4	52.3	52.2	61.1
Red Bluff, Cal	49.1	55.1	62.3	63.9	71.3	72.5	84.2	86.9	78.1	70.1	54.0	51.2	66.6
Redding, Cal	53.1	58.5	66.5	63.0	73.8	([1])	([1])	82.0	75.4	72.2	58.7	48.9	.....
Reno, Nev	42.3	40.0	41.7	48.3	63.0	64.4	76.3	77.3	62.2	51.0	40.9	37.6	53.8
Rocklin, Cal	45.6	53.1	55.6	58.9	66.0	69.2	73.5	77.8	73.0	65.6	([1])	60.3	.....
Sacramento, Cal	([1])	54.6	60.3	62.6	69.1	70.8	73.5	75.1	70.3	63.7	54.8	50.3	.....
Salinas, Cal	47.6	49.0	53.7	61.0	61.3	61.7	68.4	61.0	62.4	54.0	54.9	49.8	56.6
San Fernando, Cal	53.8	58.5	60.9	61.1	64.1	68.4	73.7	80.9	76.3	67.0	59.4	57.4	65.1
San José, Cal	49.4	51.8	55.5	55.5	([1])	61.3	65.8	65.4	64.6	61.6	56.3	51.3	.....
San Mateo, Cal	47.6	51.0	53.5	56.6	60.2	61.2	68.0	65.2	66.4	61.3	57.9	53.6	58.5
San Simon, Ariz	41.8	46.7	57.8	66.0	75.1	81.4	85.3	81.2	([1])	([1])	60.0	([1])	.....
Santa Cruz, Cal	52.7	54.5	58.6	60.6	62.4	64.5	66.6	65.6	64.7	62.5	58.4	54.9	60.5
Santa Monica, Cal	([1])	([1])	62.9	65.8	66.4	67.0	70.0	70.1	67.7	64.6	61.0	57.2	.....
Soledad, Cal	47.5	51.9	56.8	([1])	63.6	63.7	65.3	66.0	63.9	59.6	54.4	50.3	.....
Soquel, Cal	53.2	49.0	53.9	53.9	51.4	56.5	58.0	54.7	60.7	59.0	58.5	50.7	55.0
South Vallejo, Cal	52.7	57.7	61.9	65.3	67.0	67.2	67.3	66.2	66.1	62.4	57.0	49.6	61.7
Spadra, Cal	47.5	([1])	65.6	66.9	68.2	71.0	74.7	79.1	73.0	66.0	62.0	61.8	.....
Stockton, Cal	47.9	53.5	52.8	61.3	64.0	67.1	([1])	73.2	68.4	62.6	55.3	50.8	.....
Suisun City, Cal	46.9	54.8	60.5	62.2	64.4	([1])	69.0	70.3	71.0	62.7	57.1	53.2	.....
Summit, Cal	28.1	31.6	36.3	39.2	43.3	47.2	56.0	58.3	53.3	47.7	33.5	32.1	42.2
Sumner, Cal	50.6	52.7	62.8	67.3	69.6	75.4	84.2	87.6	78.3	64.6	53.6	48.6	66.3
Tocoma, Nev	23.8	35.3	45.3	59.5	63.7	69.8	81.1	80.4	71.4	59.3	41.7	33.8	55.4
Tehama, Cal	49.3	52.9	59.9	62.1	70.5	72.8	79.6	78.0	73.3	68.5	59.9	48.0	64.6
Tehachapi, Cal	37.2	38.8	45.0	52.7	60.9	64.6	74.2	77.6	65.1	56.0	46.3	44.4	55.2
Tennant, Cal	48.8	52.2	57.6	60.8	63.8	63.6	68.5	71.5	71.9	65.7	([2])	.....	.....
Terrace, Utah	25.6	37.1	43.3	57.3	61.8	60.8	80.8	78.4	68.5	60.4	46.0	31.8	54.3
Texas Hill, Ariz	49.3	57.1	68.0	75.5	86.2	88.7	96.9	95.0	88.3	75.4	([1])	([1])	.....
Toano, Nev	19.5	32.3	43.1	49.5	52.6	59.8	77.4	71.5	60.3	50.6	36.1	30.2	48.6
Towles, Cal	([1])	([1])	([1])	([1])	([1])	([1])	70.6	75.2	62.9	62.4	46.7	45.7	.....
Tracy, Cal	49.1	56.3	60.7	65.3	76.5	73.5	80.1	82.9	76.4	66.2	58.0	51.7	66.4
Truckee, Cal	27.6	34.3	39.8	42.8	49.8	52.8	62.2	61.5	53.8	46.9	36.7	31.5	45.0
Tucson, Ariz	49.2	([1])	66.3	75.4	79.1	87.4	93.4	91.1	87.8	76.5	64.8	52.1	.....
Tulare, Cal	51.0	59.8	64.4	64.8	71.1	75.4	85.0	87.7	77.1	70.3	60.0	51.3	68.2
Turlock, Cal	49.0	53.7	64.7	68.2	76.5	81.0	89.2	87.2	78.1	65.9	59.1	56.4	69.1
Wadsworth, Nev	35.0	46.7	50.7	55.7	([1])	69.5	83.2	83.8	75.1	58.5	45.2	40.0	.....
Wells, Nev	20.9	33.0	42.3	50.5	56.7	63.4	([1])	71.7	62.2	44.2	39.6	30.4	.....
Willcox, Ariz	39.3	41.7	54.5	62.9	72.3	75.6	82.9	80.9	75.4	63.8	54.3	48.3	62.7
Williams, Cal	46.8	54.6	60.3	62.3	72.6	75.3	82.3	85.5	76.8	69.6	54.3	48.2	65.7
Willow, Cal	45.2	47.2	65.8	65.0	71.6	73.1	79.2	81.9	76.9	69.0	51.0	50.5	64.7
Winnemucca, Nev	32.3	39.6	46.4	53.7	60.8	63.5	75.5	79.0	([1])	59.3	40.2	34.1	.....
Woodland, Cal	47.7	55.4	63.6	65.5	72.9	68.5	74.7	77.5	73.8	67.6	([1])	53.0	.....
Yuma, Ariz	54.0	60.1	71.4	74.8	81.8	84.9	93.4	94.4	88.9	78.5	66.6	61.2	75.8

[1] No record.

[2] Discontinued November 1, 1885.

APPENDIX 38.

Monthly maximum and minimum temperatures and annual range of temperature (in degrees ing branches, for the year

[From self-register

Stations.	January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
	°	°	°	°	°	°	°	°	°	°	°	°
Alta, Cal	58	26	62	28	72	42	70	34	84	43	84	42
Anaheim, Cal	74	36	78	40	90	42	86	51	80	60	96	62
Antioch, Cal	64	28	70	36	75	43	80	46	94	52	88	58
Aptos, Cal	66	32	72	31	82	36	78	45	76	50	90	55
Auburn, Cal	65	30	69	31	77	40	80	38	95	45	90	51
Battle Mountain, Nev	50	12	56	24	72	26	76	30	90	36	94	40
Benson, Ariz	64	23	74	30	74	44	80	50	100	58	102	68
Beowawe, Nev	52	9	57	20	72	28	75	32	87	37	90	43
Bishop Creek, Cal	65	20	74	28	80	38	84	35	103	53	102	55
Blue Creek, Cal	44	zero	48	15	66	34	72	38	79	41	95	44
Boca, Cal	60	zero	65	13	75	20	68	25	80	32	82	35
Borden, Cal	74	32	86	33	92	36	94	39	109	45	104	53
Brentwood, Cal	56	32	80	39	82	43	79	54	95	58	98	60
Brighton, Cal	66	33	72	34	80	46	86	45	100	56	92	57
Brown, Nev	50	12	64	26	76	32	83	38	96	40	96	48
Byron, Cal	62	28	74	32	82	38	90	46	110	56	98	58
Cabazon, Cal	72	32	84	34	82	46	83	44	96	50	96	52
Caliente, Cal	60	32	82	38	80	48	80	42	104	50	106	56
Calistoga, Cal	65	29	71	31	82	35	84	30	97	46	90	45
Carlin, Nev	44	4	52	16	64	24	72	30	86	34	92	32
Casa Grande, Ariz	71	32	76	36	84	51	94	55	104	59	107	68
Chico, Cal	68	35	75	35	86	45	96	48	104	50	100	58
Chualar, Cal	75	30	75	35	80	40	80	40	85	40	85	41
Cisco, Cal	40	14	(1)	(1)	55	28	58	15	78	29	70	30
Colfax, Cal	62	34	68	36	75	40	76	36	97	44	94	48
Colton, Cal	76	32	92	36	90	39	83	48	96	56	102	60
Corinne, Utah	51	−4	55	12	74	27	78	45	87	42	93	40
Davisville, Cal	62	30	74	35	80	40	86	40	104	50	95	56
Delano, Cal	70	36	82	36	84	46	90	52	105	55	98	61
Delta, Cal	60	25	70	26	76	30	80	30	96	50	96	50
Deming, N. Mex	72	29	82	25	90	40	92	53	100	61	106	70
Dunnigan, Cal	62	32	68	39	76	50	85	50	97	51	96	58
Elko, Nev	47	−4	66	20	67	21	68	25	78	40	89	37
El Paso, Tex	68	32	74	30	86	38	90	38	99	52	100	70
Emigrant Gap, Cal	49	20	59	26	64	33	64	25	80	32	78	36
Farmington, Cal	68	31	78	30	78	44	88	45	101	56	94	57
Fresno City, Cal	75	34	75	31	80	39	80	48	106	50	100	60
Galt, Cal	64	32	70	33	76	38	83	45	98	60	91	52
Gilroy, Cal	66	31	74	30	84	38	82	43	99	50	86	51
Golconda, Nev	72	11	70	27	83	25	88	39	99	43	100	41
Goshen, Cal	67	31	70	40	85	40	92	48	107	50	100	60
Halleck, Nev	58	−18	77	18	78	18	78	32	94	32	99	52
Hawthorne, Nev	52	20	64	28	70	32	70	30	92	32	93	35
Hollister, Cal	69	32	75	33	85	40	85	49	96	49	84	55
Hotel del Monte, Cal	65	35	68	35	81	41	76	43	77	52	69	52
Hot Springs, Nev	66	6	71	10	83	24	80	36	90	40	93	48
Humboldt, Nev	50	16	60	24	50	31	68	38	94	40	93	42
Indio, Cal	83	32	87	40	94	40	98	56	106	66	104	66
Ione, Cal	70	29	75	31	77	41	89	40	102	45	94	50
Keeler, Cal	(1)	(1)	68	32	72	43	77	47	95	52	94	58
Keene, Cal	64	27	68	24	77	36	80	34	94	39	95	35
Kelton, Utah	50	zero	58	20	72	25	80	40	85	40	92	40
Kingsburg, Cal	79	30	90	32	82	42	87	45	102	54	99	56
Knight's Landing, Cal	64	32	66	40	78	46	86	42	96	56	96	50
Lathrop, Cal	66	30	70	34	76	40	83	40	95	53	88	55
Lemoore, Cal	62	32	75	30	80	40	85	45	102	56	95	55

[1] No record.

APPENDIX 38.

Fahrenheit) at stations on the Central Pacific and Southern Pacific Railroads and connect-
ending December 31, 1885.

ing thermometers.]

July.		August.		September.		October.		November.		December.		Annual range.
Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	
°	°	°	°	°	°	°	°	°	°	°	°	°
([1])	([1])	([1])	([1])	([2])	....	....	....	....	....	....	....	....
90	64	101	56	106	56	88	48	84	44	86	40	70
96	60	100	62	94	60	88	47	76	43	([1])	([1])	....
80	50	85	50	90	45	80	40	78	37	76	35	59
96	56	103	58	97	54	93	50	73	38	67	29	74
98	60	100	54	92	44	84	26	70	18	56	10	90
105	72	103	70	98	62	90	47	81	30	72	22	83
98	65	102	50	91	40	83	25	72	18	62	11	93
109	72	107	70	99	53	88	42	70	24	67	20	89
107	68	165	59	85	51	79	34	60	27	43	11	107
95	40	96	40	94	28	([1])	([1])	79	15	60	10	....
112	65	118	65	109	59	106	53	89	38	74	32	86
99	59	105	62	94	66	90	56	74	42	([1])	([1])	....
102	61	109	60	103	56	98	50	83	40	69	38	76
104	72	104	61	95	50	87	85	76	26	60	25	92
106	62	112	60	100	50	98	44	78	84	([1])	([1])	....
107	60	106	62	102	58	([1])	([1])	([1])	([1])	([1])	([1])	....
102	60	109	66	100	54	90	49	78	44	66	34	77
99	54	106	48	101	48	99	35	70	32	73	31	77
94	47	104	50	94	38	86	18	72	20	60	zero	104
110	73	113	78	107	68	99	54	89	48	82	33	81
107	65	115	64	105	58	103	46	75	39	68	33	82
88	47	94	48	114	50	83	44	76	38	([1])	([1])	....
86	45	88	43	86	38	88	80	50	22	48	15	....
100	55	105	58	100	([1])	95	48	64	36	72	33	72
110	60	116	65	112	54	108	42	90	45	74	33	84
99	62	103	50	86	43	73	29	62	20	50	6	107
105	60	112	62	108	62	106	50	82	39	69	35	82
105	60	([1])	67	105	60	100	53	([1])	([1])	69	35	....
106	64	111	54	([1])	([1])	([1])	([1])	70	30	64	28	....
108	74	108	73	100	60	94	54	84	30	86	23	85
104	60	112	60	100	59	100	48	74	40	58	32	80
98	49	98	48	94	38	84	18	68	20	52	zero	102
107	75	112	68	94	70	84	42	82	35	80	14	98
88	51	91	52	88	42	82	39	62	30	58	24	71
103	65	111	60	105	57	103	45	78	40	70	33	81
104	72	113	65	([1])	([1])	98	48	76	38	68	40	....
100	62	108	50	100	50	96	50	70	38	72	39	76
96	52	104	50	102	50	92	40	78	33	72	29	75
103	63	109	60	103	42	102	35	80	23	78	18	98
115	64	116	60	104	65	102	48	82	33	71	35	85
105	44	107	54	98	38	86	24	70	22	56	— 8	125
102	62	102	62	95	50	86	46	70	26	60	20	82
98	52	103	53	102	52	102	42	72	42	76	34	71
75	54	76	53	72	44	72	41	74	38	73	35	46
99	58	103	58	96	38	90	20	70	14	68	16	97
90	60	96	56	84	45	80	29	64	31	62	26	80
108	72	114	76	108	62	104	54	90	35	81	32	82
104	50	107	62	100	56	90	45	72	35	62	28	79
101	72	103	70	95	57	85	54	([1])	([1])	61	35	....
97	55	102	51	95	47	95	44	74	40	78	30	78
93	50	104	50	90	45	68	30	60	15	60	([1])	....
105	64	111	62	104	57	96	44	70	30	68	34	81
102	58	110	58	102	56	100	48	86	40	70	40	78
94	58	102	55	99	52	94	40	74	37	65	35	72
104	65	105	68	100	60	94	45	75	35	75	30	75

[2] Discontinued.

Monthly maximum and minimum temperatures and annual range of temperature (in degrees

Stations.	January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
	°	°	°	°	°	°	°	°	°	°	°	°
Livermore, Cal	84	28	84	34	86	40	84	42	98	48	84	48
Lordsburg, N. Mex	60	24	68	25	78	32	88	50	95	50	100	70
Los Angeles, Cal	74	46	80	42	88	50	86	52	81	56	87	59
Mammoth Tank, Cal	83	39	91	49	95	50	105	58	124	65	118	74
Maricopa, Ariz	71	28	75	35	85	45	93	51	108	67	108	65
Martinez, Cal	60	36	64	40	71	40	76	48	88	50	80	54
Marysville, Cal	[1]	[1]	76	34	83	54	84	50	98	58	97	60
Menlo Park, Cal	64	32	72	32	74	38	82	40	92	49	81	49
Merced, Cal	70	36	78	32	88	40	90	40	102	46	96	54
Modesto, Cal	65	35	71	41	90	48	85	49	108	60	96	59
Mojave, Cal	72	25	72	32	76	30	85	40	105	45	100	45
Monterey, Cal	61	36	66	33	69	42	76	48	76	53	69	54
Napa City, Cal	60	29	78	32	81	32	89	32	99	41	89	53
Newhall, Cal	74	24	82	28	85	40	89	44	96	50	94	50
Niles, Cal	63	35	75	36	75	40	82	50	96	50	83	53
Oakland, Cal	62	38	64	40	70	44	74	46	70	48	70	50
Ogden City, Utah	55	— 8	58	15	82	24	80	31	88	25	103	36
Orland, Cal	69	38	70	42	88	50	90	46	102	53	98	54
Pajaro, Cal	68	33	70	30	88	35	82	35	80	45	83	50
Palisade, Nev	48	— 5	56	10	70	22	76	30	86	38	98	36
Pantano, Ariz	82	30	86	30	90	45	92	40	101	56	102	62
Petaluma, Cal	70	32	78	34	82	38	82	44	92	48	78	52
Pleasanton, Cal	65	32	85	32	86	39	84	42	97	51	84	48
Promontory, Utah	48	—14	52	18	58	30	70	40	88	45	92	46
Ravenna, Cal	70	23	85	22	80	34	86	44	96	40	100	40
Red Bluff, Cal	70	34	72	34	90	40	90	46	104	44	100	50
Redding, Cal	78	34	79	40	85	50	96	49	108	49	[1]	[1]
Reno, Nev	58	10	62	20	60	25	76	26	92	38	92	40
Rocklin, Cal	67	31	70	32	69	36	75	40	100	50	99	52
Sacramento, Cal	61	38	68	40	75	45	82	46	96	57	90	56
Salinas, Cal	64	30	70	34	70	40	85	42	80	50	74	52
San Fernando, Cal	75	37	84	38	86	42	90	46	92	53	91	53
San José, Cal	68	35	68	36	80	40	76	40	90	48	78	50
San Mateo, Cal	66	34	68	36	75	41	72	43	86	50	75	53
San Simon, Ariz	58	26	74	26	78	40	86	44	92	60	96	70
Santa Cruz, Cal	66	38	74	38	82	45	80	44	84	49	83	51
Santa Monica, Cal	[1]	[1]	[1]	[1]	70	55	88	55	80	58	95	60
Soledad, Cal	68	30	80	28	82	32	[1]	[1]	96	48	82	41
Soquel, Cal	74	36	76	32	84	40	78	36	78	36	84	38
South Vallejo, Cal	66	42	70	42	72	50	82	54	89	53	78	57
Spadra, Cal	82	36	[1]	[1]	89	48	94	51	85	56	89	59
Stockton, Cal	61	36	68	39	72	42	80	45	96	52	85	54
Suisun City, Cal	64	35	74	35	84	45	88	43	100	48	[1]	[1]
Summit, Cal	40	11	46	18	50	24	54	12	68	23	68	32
Sumner, Cal	77	33	76	31	88	44	92	45	104	50	97	55
Tecoma, Nev	42	—10	54	20	65	30	78	40	85	49	89	49
Tehama, Cal	64	32	70	36	82	40	88	34	102	40	98	52
Tehachapi, Cal	57	20	58	22	68	28	72	30	90	40	96	46
Tennant, Cal	70	31	71	26	93	34	85	38	102	50	86	47
Terrace, Utah	58	— 4	68	20	72	18	80	38	84	40	94	40
Texas Hill, Ariz	76	24	84	28	94	43	100	55	119	70	115	68
Toano, Nev	40	— 4	50	16	68	32	65	32	82	35	85	32
Towles, Cal	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]
Tracy, Cal	64	30	74	40	80	42	90	50	104	60	96	62
Truckee, Cal	48	2	52	12	62	22	65	22	83	30	82	33
Tucson, Ariz	70	37	75	44	85	50	94	48	102	63	105	78
Tulare, Cal	70	33	76	40	85	49	87	50	105	51	99	57
Turlock, Cal	81	36	82	30	87	40	92	42	105	48	101	60
Wadsworth, Nev	60	14	67	20	76	28	81	34	[1]	[1]	94	48
Wells, Nev	40	—10	50	16	64	20	70	32	86	34	90	36
Willcox, Ariz	65	20	72	20	85	32	84	40	100	55	98	60
Williams, Cal	65	30	74	42	83	44	86	39	103	55	96	58
Willow, Cal	58	32	57	41	79	40	72	51	103	54	96	56
Winnemucca, Nev	53	10	60	10	76	24	75	32	83	40	84	42
Woodland, Cal	68	34	76	35	82	45	84	48	100	56	94	52
Yuma, Ariz	80	40	77	43	85	55	98	61	102	71	99	68

[1] No record.

Fahrenheit), at stations on Central Pacific and Southern Pacific Railroads, &c.—Continued

July.		August.		September.		October.		November.		December.		Annual range.
Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	
°	°	°	°	°	°	°	°	°	°	°	°	°
(1)	(1)	105	48	106	50	104	40	73	30	68	36	....
104	76	102	74	95	64	90	40	73	30	64	20	84
97	62	101	62	105	64	86	60	77	55	73	50	63
127	77	180	78	124	70	113	62	94	50	84	44	91
112	78	114	75	109	61	107	47	86	35	84	28	86
90	54	96	50	88	52	88	44	70	38	68	36	60
102	64	106	60	(1)	(1)	87	49	78	40	(1)	(1)	....
94	51	96	51	95	46	88	39	70	35	66	34	64
107	58	112	58	106	54	98	42	80	36	76	38	80
103	60	110	55	100	51	96	44	80	40	64	35	75
105	67	106	67	101	60	88	48	83	30	80	28	81
72	50	78	55	73	49	71	42	74	37	73	35	45
95	54	99	54	95	45	95	39	75	34	65	30	70
106	52	112	60	108	55	102	45	83	34	80	32	88
90	55	97	55	97	50	83	45	71	42	67	36	62
80	56	80	54	76	52	66	46	68	44	66	44	42
103	58	105	55	92	45	84	28	67	22	56	10	113
102	62	110	62	98	60	99	54	72	44	78	38	72
90	55	85	54	98	40	92	40	70	38	75	38	68
100	58	103	52	94	34	86	18	68	22	48	10	108
104	70	101	69	100	70	99	59	89	42	79	32	74
95	58	103	50	(1)	(1)	89	42	77	36	68	35	....
96	59	(1)	(1)	102	58	(1)	(1)	72	36	68	33	....
98	65	105	58	90	52	78	38	60	20	49	12	119
106	55	110	55	106	50	102	35	86	30	74	26	88
110	64	113	64	104	56	100	50	76	40	78	34	70
(1)	(1)	106	64	104	(1)	100	57	70	40	65	33	....
100	52	101	56	88	46	82	30	70	26	48	20	91
100	58	108	54	100	52	96	43	(1)	(1)	84	38	....
91	59	99	59	91	52	88	46	72	41	62	40	61
78	54	70	56	93	53	64	44	68	42	60	34	63
106	54	113	56	102	58	103	45	82	44	80	38	76
86	50	95	54	98	50	90	44	74	38	66	34	64
88	58	92	56	92	54	82	46	74	43	69	40	58
111	72	98	68	(1)	(1)	(1)	(1)	85	45	(1)	(1)	....
88	52	90	51	96	48	93	45	76	40	76	37	59
84	62	80	64	77	60	75	54	71	53	80	44	....
94	50	96	50	102	44	92	40	78	32	76	28	....
86	40	80	40	78	42	78	42	76	50	76	36	54
82	58	86	55	90	50	83	50	70	50	70	32	58
102	56	108	60	114	54	104	50	84	45	87	37	....
(1)	(1)	102	54	95	53	90	44	68	38	60	40	....
95	57	102	56	105	55	100	45	80	40	68	38	....
75	42	79	42	77	36	73	28	54	22	41	13	68
106	62	113	65	108	62	96	42	68	40	66	30	83
102	69	100	62	100	44	100	33	68	20	60	8	112
108	62	110	58	100	58	100	46	78	46	66	36	78
94	58	102	52	90	44	88	38	68	32	70	22	82
93	50	103	51	102	50	101	49	(2)	....	....	....	....
96	64	102	50	92	44	86	36	68	32	54	14	106
117	76	118	76	112	65	104	50	(1)	(1)	90	31	....
100	54	95	50	87	37	80	22	64	14	49	2	104
90	50	98	54	86	46	84	44	70	38	74	28	....
100	68	108	64	102	60	98	27	78	38	68	38	78
92	40	90	40	86	34	83	24	64	20	48	11	90
107	83	109	80	104	80	93	61	85	49	63	43	72
107	68	113	65	107	53	99	51	83	42	73	33	80
106	61	114	58	104	55	98	40	80	40	80	35	84
102	68	102	68	98	44	88	32	74	20	60	20	....
94	(1)	98	58	84	42	61	27	65	19	45	12	108
103	68	100	66	95	55	95	37	80	28	77	15	88
102	65	110	63	100	60	100	48	75	40	60	38	80
99	60	109	63	101	60	99	53	75	42	60	40	77
94	62	101	60	90	45	85	36	68	21	56	15	91
102	59	106	53	99	55	96	49	(1)	(1)	64	42	....
107	81	109	82	105	73	97	65	85	50	80	45	69

[2] Discontinued November 1, 1885.

APPENDIX 39.

Mean of the maximum and minimum temperatures (in degrees Fahrenheit) at the cotton-region stations of the Signal Service, United States Army, for the period from May to October, 1885, both inclusive.

[These means are obtained by dividing the sums of the daily readings of self-registering thermometers by the number of observations taken—one daily, at 5 p. m., Central time.]

											tober.	
											x.	Min.
	°	°	°	°	°	°	°	°	°	°	°	°
Wilmington, N. C.:												
Charlotte, S. C	83.3	58.3	89.3	66.4	87.1	70.2	88.0	69.3	78.4	62.9	68.7	48.2
Cheraw, S. C.	74.8	58.5	84.3	67.4	93.1	69.7	89.3	69.3	[illegible]	64.0	70.4	48.4
Florence, S. C	82.6	59.9	89.7	68.1	92.4	71.2	90.8	70.5	82.7	64.6	[illegible]	51.5
Goldsborough, N. C.	78.2	58.0	86.1	66.9	90.9	71.1	88.0	70.5	81.3	64.7	[illegible]	50.3
Lumberton, N. C.	80.8	56.8	86.7	66.1	[illegible]	69.2	87.9	[illegible]	80.4	62.8	68.9	48.2
New-Berne, N. C	79.9	57.8	87.1	[illegible]	93.9	69.7	87.4	67.3	81.1	58.7	70.7	45.2
Raleigh, N. C	79.3	56.3	88.3	[illegible]	92.7	69.0	89.0	67.0	81.7	61.4	69.1	49.5
Salisbury, N. C	80.9	41.7	90.7	51.6	92.8	55.8	89.6	[illegible]	82.6	47.3	68.5	33.5
Wadesborough, N. C.	81.7	49.3	90.0	59.2	[illegible]	62.4	89.4	61.8	81.0	54.9	66.9	40.7
Weldon, N. C	76.7	58.8	86.6	65.0	[illegible]	69.7	88.2	68.6	83.4	60.0	(*)	(*)
Wilmington, N. C.	79.0	62.9	84.6	[illegible]	[illegible]	73.8	87.6	72.5	81.1	65.3	70.9	52.6
Charleston, S. C.:												
Branchville, S. C	82.8	60.0	89.2	68.3	90.3	71.5	88.9	[illegible]	[illegible]	65.5	70.6	52.1
Charleston, S. C.	79.9	66.4	86.8	73.6	89.1	[illegible]	[illegible]	[illegible]	81.7	71.1	71.4	58.6
Hardeeville, S. C	84.5	58.7	90.8	69.1	[illegible]	72.1	91.6	[illegible]	84.1	66.0	73.1	52.4
Jacksonborough, S. C.	77.4	55.1	83.7	63.5	87.7	71.8	89.1	72.8	83.7	66.2	72.2	52.0
Kingstree, S. C	82.7	57.3	88.9	64.0	92.3	62.6	90.5	61.8	(*)	(*)	(*)	(*)
Saint George's, S. C.	84.9	55.7	91.4	64.2	92.6	67.3	91.1	67.2	83.3	61.5	72.0	46.4
Saint Matthew's, S. C.	83.2	59.0	[illegible]	68.1	90.9	70.3	88.8	70.2	82.6	63.8	72.3	48.1
Yemassee, S. C	83.8	58.4	89.8	67.8	91.6	71.2	89.4	70.3	82.8	66.1	72.3	51.3
Augusta, Ga.:												
Allendale, S. C	82.9	60.3	[illegible]	[illegible]	91.7	71.4	[illegible]	69.6	[illegible]	65.6	72.3	52.4
Athens, Ga	84.6	56.4	94.3	65.6	95.9	67.0	90.5	68.3	81.3	[illegible]	68.5	44.2
Augusta, Ga	83.0	60.5	91.0	68.7	93.5	72.0	92.4	71.0	84.3	[illegible]	72.2	50.8
Batesburg, S. C	82.8	60.4	91.4	67.2	94.6	69.6	91.3	68.8	82.8	64.1	69.4	48.9
Blackville, S. C	82.8	58.2	89.9	66.9	91.5	70.5	89.7	69.5	81.8	[illegible]	70.6	50.3
Camak, Ga	84.2	55.3	92.0	65.3	96.0	68.1	93.6	67.3	83.6	63.2	69.9	48.1
Chester, S. C	82.3	58.0	90.3	67.0	93.4	69.4	90.5	69.3	82.8	62.8	67.3	47.1
Columbia, S. C.	80.0	60.2	88.0	68.3	89.4	71.5	88.2	70.5	81.1	64.6	69.8	49.6
Greenwood, S. C.	80.3	57.7	89.0	67.0	91.3	69.3	89.3	67.7	81.6	61.2	68.2	45.3
Union Point, Ga.	77.5	54.9	85.7	63.8	89.8	68.0	88.2	66.4	79.6	62.0	67.6	46.2
Washington, Ga.	83.5	58.4	91.7	67.8	96.1	70.7	95.5	70.5	84.9	62.7	72.0	50.5
Waynesborough, Ga.	83.8	60.1	91.4	68.3	96.3	70.5	94.4	70.1	83.9	[illegible]	70.5	50.6
Savannah, Ga.:												
Albany, Ga	84.3	63.1	91.7	72.4	93.0	73.1	90.9	73.6	85.2	71.0	73.5	54.1
Allapaha, Ga	80.6	57.9	90.8	67.9	91.7	69.4	90.7	[illegible]	83.7	63.6	73.3	50.1
Bainbridge, Ga	83.6	65.1	90.5	70.8	91.0	71.6	89.3	74.5	85.0	70.5	72.9	52.7
Cedar Keys, Fla.	81.7	69.9	87.5	76.5	87.5	76.5	87.4	76.1	[illegible]	74.8	[illegible]	62.5
Eastman, Ga	83.9	59.0	91.9	68.9	93.9	72.5	91.8	71.7	83.8	67.9	72.9	52.6
Fernandina, Fla.	80.1	67.4	88.5	73.0	88.5	75.7	89.0	73.2	[illegible]	72.2	72.4	62.5
Fort Gaines, Ga	84.5	59.9	92.4	69.2	93.6	70.3	[illegible]	71.4	85.0	67.5	70.5	50.2
Jessup, Ga	85.0	60.5	92.7	69.3	95.0	72.3	[illegible]	71.5	84.8	[illegible]	74.2	55.0
Live Oak, Fla.	86.0	60.6	92.0	[illegible]	94.3	71.9	91.9	71.9	85.4	[illegible]	[illegible]	55.9
Millen, Ga	85.5	59.5	92.1	67.8	96.1	69.5	92.5	70.1	[illegible]	65.9	72.7	50.6
Quitman, Ga	86.4	61.3	94.1	69.6	94.6	71.5	92.3	71.8	86.6	69.7	[illegible]	54.9
Savannah, Ga	80.9	66.2	86.7	72.8	90.1	75.8	87.6	74.9	81.5	71.8	[illegible]	58.2
Smithville, Ga.	87.7	61.8	95.1	69.5	[illegible]	70.1	95.8	70.6	[illegible]	71.0	75.0	51.4
Thomasville, Ga.	83.3	61.3	90.3	68.2	91.3	69.7	91.3	70.1	83.4	[illegible]	[illegible]	54.3
Waldo, Fla	87.1	58.3	91.6	70.7	94.8	71.6	93.0	67.4	89.5	68.0	79.2	55.7
Way Cross, Ga.	83.5	61.9	91.5	70.4	93.7	73.5	[illegible]	72.1	84.6	70.0	75.8	56.0
Atlanta, Ga.:												
Anderson, S. C.	83.2	55.2	92.4	65.8	95.0	68.2	90.4	67.6	81.5	61.6	66.2	46.3
Atlanta, Ga.	74.8	59.0	[illegible]	69.3	86.5	71.1	84.6	69.8	76.3	64.0	64.9	48.6
Cartersville, Ga	77.1	53.3	90.2	65.7	91.6	68.2	88.6	68.1	80.2	62.8	66.8	44.7
Columbus, Ga.	78.5	60.3	86.0	[illegible]	84.0	72.0	88.8	71.1	79.6	66.7	67.0	53.4
Dalton, Ga.	80.0	53.6	92.5	65.1	[illegible]	67.6	90.1	67.5	81.2	[illegible]	66.5	45.6

* No record.

Mean of the maximum and minimum temperatures (in degrees Fahrenheit) at the cotton-region stations, &c.—Continued.

	°	°	°	°	°	°	°	°	°	°	°	°
Atlanta, Ga.—Continued:												
Gainesville, Ga	79.0	88.5	88.4	68.4	91.1	68.0	87.2	[illegible]	80.0	60.5	[illegible]	44.9
Greenville, S. C	81.1	88.5	91.3	64.0	88.5	68.0	87.3	67.4	80.8	61.2	63.9	46.2
Griffin, Ga	76.5	88.3	88.7	68.4	89.2	70.0	87.0	70.1	79.3	65.5	67.0	50.7
Macon, Ga	83.3	88.8	91.7	68.6	94.1	71.2	91.7	70.8	82.2	67.1	70.3	50.9
Newnan, Ga	81.4	86.6	88.9	67.3	92.7	68.7	90.5	69.6	82.0	62.9	68.1	47.4
Spartanburg, S. C	80.3	86.0	88.6	65.0	92.1	68.3	90.6	66.5	82.0	61.3	71.5	46.3
Toccoa, Ga	80.5	84.4	88.7	64.3	90.7	66.1	87.4	68.1	79.3	61.0	65.6	46.4
West Point, Ga	80.3	68.7	88.6	68.1	91.5	70.4	88.5	70.1	81.3	[illegible]	[illegible]	[illegible]
Montgomery, Ala.:												
Birmingham, Ala	80.4	83.0	90.6	61.7	93.7	67.0	93.7	68.3	83.7	65.5	70.6	47.0
Calera, Ala	85.6	84.3	86.0	66.0	94.7	68.1	84.1	66.9	87.8	60.8	71.5	44.0
Eufaula, Ala	82.0	60.1	80.4	68.2	90.3	70.3	88.7	71.3	81.2	67.8	71.7	51.2
Fort Deposit, Ala	81.3	71.0	88.4	71.2	90.5	70.5	88.6	68.3	82.8	68.2	70.7	48.4
Greenville, Ala	82.0	74.3	88.5	73.0	91.7	72.0	80.0	70.6	83.4	67.9	[illegible]	50.5
Marion, Ala	82.4	64.0	86.0	68.2	86.0	66.5	85.6	67.2	84.2	66.9	([1])	([1])
Montgomery, Ala	80.3	61.5	86.6	70.4	91.0	71.7	80.3	72.2	82.1	68.2	70.7	52.4
Opelika, Ala	80.6	66.4	88.2	67.4	80.6	74.4	88.0	[illegible]	73.7	60.4	68.1	40.6
Pine Apple, Ala	81.0	67.8	88.0	68.2	88.5	67.3	91.2	67.5	86.3	62.0	72.0	46.5
Selma, Ala	88.1	88.0	88.6	68.6	91.6	72.1	90.5	69.6	84.7	67.6	72.3	50.6
Mobile, Ala.:												
Aberdeen, Miss	81.1	68.1	88.0	68.3	91.8	68.3	91.5	64.0	84.2	62.0	71.1	47.3
Columbus, Miss	84.0	80.2	86.3	72.6	91.4	71.8	88.0	69.0	80.5	68.1	72.0	42.5
Evergreen, Ala	([1])	([1])	([1])	([1])	([1])	([1])	90.8[3]	78.1[3]	85.0	74.3	72.7	57.0
Livingston, Ala	83.0	67.7	84.0	77.0	86.3	74.7	93.7	71.0	86.5	67.1	74.3	48.4
Macon, Miss	83.3	86.8	86.0	68.3	96.0	71.5	91.0	70.4	85.9	64.0	75.0	47.4
Meridian, Miss	82.8	61.5	88.7	71.1	94.6	70.0	92.5	70.6	86.0	68.3	72.5	48.4
Mobile, Ala	80.2	64.1	88.3	71.0	88.8	72.0	88.4	73.3	84.0	70.0	72.9	54.1
Okolona, Miss	84.3	63.8	92.0	73.0	96.0	73.8	95.6	71.0	86.3	68.0	[illegible]	40.3
Waynesborough, Miss	83.7	60.1	91.3	60.1	92.3	78.1	91.1	71.4	83.4	67.2	72.6	40.6
New Orleans, La.:												
Alexandria, La	81.1	62.4	92.2	68.7	88.0	71.0	80.7	71.0	84.8	68.0	72.7	[illegible]
Amite City, La	82.1	66.6	91.6	68.2	87.7	70.4	87.8	67.1	80.6	68.0	71.5	49.9
Brookhaven, Miss	82.4	62.8	94.0	67.8	93.3	68.5	91.2	68.4	84.8	[illegible]	71.9	48.2
Cheneyville, La	84.3	61.5	86.2	68.3	88.0	70.0	88.6	68.6	[illegible]	64.4	77.8	49.9
Conshatta Chute, La	80.8	60.7	88.3	68.5	91.0	71.5	91.0	70.5	85.9	68.8	73.9	48.4
Hazlehurst, Miss	80.1	60.4	90.1	68.3	96.8	70.1	91.4	70.1	84.8	68.6	72.1	50.8
Lafayette, La	82.5	64.6	91.6	70.6	91.5	73.1	90.3	72.6	86.1	69.8	70.4	52.4
Minden, La	82.9	67.6	94.3	68.8	96.4	70.4	94.2	[illegible]	86.4	65.4	73.2	47.3
Natchez, Miss	82.0	61.0	92.3	68.2	[illegible]	71.6	80.6	70.8	84.0	67.9	72.2	50.0
Natchitoches, La	82.0	60.5	91.3	68.6	91.6	72.0	90.3	71.0	83.7	67.9	73.5	49.7
New Orleans, La	80.5	68.4	88.0	76.5	90.1	76.0	80.2	74.8	83.2	72.8	73.6	58.5
Opelousas, La	84.2	62.6	88.1	68.1	88.3	71.6	82.9	70.5	86.7	67.7	78.4	49.7
Port Gibson, Miss	([1])	([1])	([1])	([1])	80.0	71.3	88.3	70.5	[illegible]	68.0	[illegible]	48.7
Shreveport, La	82.6	62.3	82.4	72.8	88.7	74.3	92.7	73.8	85.3	[illegible]	72.5	51.0
Galveston, Tex.:												
Austin, Tex	([1])	([1])	86.1	72.2	86.3	73.5	86.2	76.3	89.5	68.8	[illegible]	[illegible]
Belton, Tex	80.9	57.5	92.0	54.8	96.7	48.3	97.8	64.3	[illegible]	[illegible]	82.4	58.0
Brenham, Tex	([1])	([1])	([1])	([1])	([1])	([1])	([1])	([1])	82.7	68.4	78.4	56.0
Columbia, Tex	82.2	68.4	88.7	72.8	91.2	72.0	91.4	72.8	85.6	70.2	77.8	55.5
Corsicana, Tex	80.1	58.7	94.3	62.7	96.3	66.5	95.7	68.6	87.0	60.3	76.6	43.3
Cuero, Tex	86.5	64.5	97.0	72.0	96.0	72.5	96.3	72.0	89.2	70.3	80.4	[illegible]
Dallas, Tex	83.8	([1])	94.1	67.4	[illegible]	72.5	97.6	72.1	88.0	[illegible]	76.7	50.5
Galveston, Tex	81.3	70.8	88.7	78.0	80.3	78.7	88.8	78.3	84.5	75.1	75.2	62.0
Hearne, Tex	83.2	58.2	88.4	68.7	96.7	72.0	88.9	71.8	80.0	68.8	72.0	58.3
Houston, Tex	83.6	68.5	88.5	71.8	[illegible]	72.0	80.8	72.0	80.6	70.4	78.3	[illegible]
Huntsville, Tex	82.3	61.7	92.7	70.0	[illegible]	72.3	[illegible]	72.6	[illegible]	68.6	78.6	53.8
Longview, Tex	82.3	([1])	90.3	64.4	[illegible]	70.6	[illegible]	72.5	90.4	70.1	75.2	48.5
Luling, Tex	([1])	([1])	92.3	76.7	92.1	75.0	[illegible]	78.3	([1])	([1])	([1])	([1])
Orange, Tex	80.9[4]	68.6[4]	90.5	78.3	92.5	80.4	91.1	77.1	88.1	72.3	81.9	60.4
Palestine, Tex	78.5	61.3	88.4	70.0	([1])	([1])	[illegible]	72.2	84.8	[illegible]	72.3	52.8
San Antonio, Tex	81.2[2]	68.6[2]	91.4	71.1	88.8	71.4	94.2	72.3	[illegible]	68.5	[illegible]	56.3
Sour Lake, Tex	84.4[2]	64.2[2]	91.8	68.7	[illegible]	70.3	92.3	70.4	87.7	68.7	([1])	([1])
Tyler, Tex	82.5	58.0	92.6	68.8	94.7	72.5	94.1	70.5	87.7	68.5	78.0	50.7
Waco, Tex	82.0	61.0	92.6	71.7	93.8	71.7	94.8	71.0	83.8	68.6	71.8	53.3
Weatherford, Tex	78.8	50.3	88.6	58.6	96.7	60.0	94.6	60.6	84.2	54.7	73.2	42.0
Weimar, Tex	80.7	62.1	94.6	71.8	94.5	73.6	96.6	73.1	80.7	70.6	81.0	54.6
Vicksburg, Miss.:												
Edwards, Miss	82.3	61.2	92.0	71.0	[illegible]	72.3	80.4	70.3	84.5	63.4	72.2	48.5
Jackson, Miss	84.3	58.2	94.1	68.4	93.3	72.4	92.4	68.5	85.2	66.6	72.1	48.0
Lake, Miss	82.3	54.2	92.9	58.8	92.7	59.4	91.4	64.1	82.9	64.5	72.6	44.7
Monroe, La	80.1	60.0	91.2	70.3	93.4	72.8	91.3	71.0	84.7	66.7	72.2	49.5
Vicksburg, Miss	81.3	62.5	91.6	74.2	92.4	72.4	90.3	71.8	83.4	67.3	72.0	52.7
Little Rock, Ark.:												
Arkansas City, Ark	([1])	([1])	([1])	([1])	85.8	72.3	91.4	71.0	82.7	60.1	68.2	[illegible]
Brinkley, Ark	81.0	58.5	91.0	66.2	96.5	71.6	94.8	67.6	88.5	62.5	72.5	44.0
Devall's Bluff, Ark	78.2	52.6	88.5	63.1	93.6	67.0	92.1	64.3	84.1	60.7	73.0	42.5

[1] Record incomplete. [2] For 23 days. [3] For 18 days. [4] For 16 days.

Mean of the maximum and minimum temperatures (in degrees Fahrenheit) at the cotton-region stations, &c.—Continued.

Districts and stations.	May.		June.		July.		August.		September.		October.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
	°	°	°	°	°	°	°	°	°	°	°	°
Little Rock, Ark.—Con'd:												
Fort Smith, Ark	76.8	56.7	86.3	67.9	91.8	71.2	89.1	68.2	83.1	62.6	71.3	47.4
Helena, Ark	80.2	57.1	91.6	68.8	94.0	71.5	91.5	68.6	83.7	63.2	69.9	46.3
Kensett, Ark	73.1[1]	56.7[1]	83.1	67.2	87.5	69.6	86.3	65.1	78.3	61.0	63.5	45.9
Little Rock, Ark	77.9	60.1	89.0	71.8	94.2	75.4	91.0	72.7	83.1	67.0	70.8	52.0
Madison, Ark	83.0	53.6	91.5	65.6	97.3	67.4	96.5	61.3	88.8	56.1	77.9	38.5
Magnolia, Ark	83.3	56.0	93.7	69.2	95.2	71.9	93.8	70.6	86.8	64.6	73.8	46.9
Malvern, Ark	82.0	51.8	94.4	66.9	99.3	66.2	95.3	62.0	86.0	60.0	74.3	44.9
Monticello, Ark	79.8	57.0	92.1	66.7	93.8	72.5	93.7	70.2	86.0	64.1	71.8	46.6
Newport, Ark	80.1	57.4	93.5	67.0	93.6	71.6	90.8	67.7	85.6	62.7	68.5	43.2
Paris, Tex	80.1	53.0	90.4	64.2	93.5	65.3	92.9	64.6	85.4	58.2	74.6	49.8
Pine Bluff, Ark	78.9	51.1	90.1	65.9	93.7	72.1	92.7	70.1	(2)	(2)	(2)	(2)
Prescott, Ark	81.1	49.6	93.4	61.5	97.0	62.7	93.7	61.5	86.2	56.2	74.8	41.2
Russellville, Ark	75.8	56.6	90.9	67.4	92.1	68.5	94.2	67.6	85.9	62.2	72.6	44.8
Texarkana, Ark	81.9	43.8	88.9	67.1	92.3	71.7	92.3	70.5	86.4	65.8	75.5	48.1
Memphis, Tenn.:												
Arlington, Tenn	79.9	64.1	89.8	65.2	92.5	67.2	91.8	57.8	86.2	55.8	71.9	37.2
Batesville, Miss	81.0	56.4	83.8	68.3	95.5	70.6	92.6	67.7	82.8	64.2	70.6	46.8
Bolivar, Tenn	76.6	54.7	87.0	66.9	89.8	71.9	90.6	66.7	83.1	61.5	70.1	46.7
Brownsville, Tenn	79.2	57.0	89.1	67.6	91.4	70.6	90.7	67.5	83.9	61.8	69.2	46.9
Corinth, Miss	80.1	54.2	88.2	67.9	92.6	68.5	93.4	65.1	84.4	60.5	(3)	(3)
Covington, Tenn	79.1	55.7	89.4	67.1	91.6	69.7	90.6	66.3	83.9	61.4	69.5	46.0
Decatur, Ala	80.4	54.8	91.9	65.7	93.0	69.4	91.6	68.6	82.5	62.7	69.9	45.6
Dyersburg, Tenn	76.3	55.2	86.3	66.3	89.7	69.7	88.2	66.5	79.8	60.4	64.4	44.7
Grand Junction, Tenn	77.3	56.4	88.3	67.3	89.7	69.9	90.6	67.3	83.1	62.9	68.3	47.6
Grenada, Miss	84.5	52.1	93.2	59.2	94.5	68.6	92.8	63.4	86.4	60.8	(2)	(2)
Hernando, Miss	82.9	56.8	91.0	80.4	96.4	80.8	90.6	71.6	81.7	62.5	65.2	44.8
Holly Springs, Miss	77.9	59.3	89.1	70.3	90.6	70.7	90.4	69.3	82.0	64.5	67.5	48.[illegible]
Memphis, Tenn	77.6	56.7	89.0	70.7	90.8	74.9	89.0	72.0	81.6	66.1	68.3	52.0
Milan, Tenn	80.7	55.1	92.1	66.7	92.5	68.7	92.2	66.1	84.3	59.8	69.3	44.7
Nashville, Tenn	75.1	57.3	84.3	68.5	88.1	71.2	87.4	70.1	80.0	65.5	66.4	51.0
Oxford, Miss	79.4	56.6	90.7	68.3	93.0	70.9	92.0	68.7	83.8	65.3	70.6	46.9
Paris, Tenn	73.4	47.9	87.4	57.1	89.9	65.5	89.5	63.4	82.2	56.2	67.3	48.7
Scottsborough, Ala	77.7	55.8	87.3	65.7	89.1	68.5	88.3	66.2	81.0	60.5	68.1	44.6
Tuscumbia, Ala	77.9	54.6	90.1	65.6	90.5	69.5	91.6	68.9	82.8	62.6	69.5	46.8

[1] For 24 days. [2] No record. [3] Record incomplete.

APPENDIX 40.

Average temperature (in degrees Fahrenheit) of the surface of the ocean at stations of the Signal Service, United States Army, on the Atlantic and Gulf coasts for each month of the year.

[Computed from observations taken at 2 p. m., daily, from the date observations began, to December, 1885, inclusive. Prior to January 1, 1885, observations were taken on Washington time; from January 1 to December 31, 1885, on 75th meridian time.]

Stations.	Observations begun.		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
			°	°	°	°	°	°	°	°	°	°	°	°
Eastport, Me	May,	1874	35.9	33.1	32.7	35.5	39.1	42.9	46.8	49.8	50.6	49.8	46.2	41.0
Portland, Me	Dec.,	1873	33.4	32.0	33.5	39.2	47.0	54.8	59.6	61.0	57.8	52.3	44.6	36.9
Boston, Mass	May,	1881	33.0	31.6	34.1	42.4	51.7	60.0	64.6	64.9	62.3	54.7	44.3	35.9
Block Island, R. I	May,	1881	37.1	34.6	36.5	42.5	49.8	58.4	65.5	67.2	64.5	57.7	49.8	41.7
New London, Conn	Apr.,	1874	36.0	35.1	38.4	46.6	56.2	66.4	71.4	71.9	67.7	59.8	49.6	40.4
New Haven, Conn	May,	1881	32.9	32.4	35.6	45.4	56.0	66.2	72.6	73.4	68.4	58.8	46.7	37.1
New York City	Dec.,	1873	33.4	32.6	35.6	43.6	54.8	65.9	72.4	73.3	69.3	60.1	48.5	38.4
Sandy Hook, N. J	May,	1881	37.8	36.1	38.6	44.4	53.3	63.3	70.9	73.3	70.3	61.4	51.3	41.9
Atlantic City, N. J	May,	1881	35.8	37.0	39.7	47.7	56.2	65.7	72.1	72.8	71.1	62.3	52.3	41.4
Chincoteague, Va	May,	1880	38.0	40.9	43.0	52.4	65.4	75.0	80.0	78.8	75.2	66.2	51.8	41.8
Norfolk, Va	Dec.,	1873	41.2	44.5	49.5	56.1	67.3	76.0	80.9	80.5	74.8	65.3	54.4	44.0
Fort Macon, N. C	July,	1883	48.2	52.0	54.0	61.0	71.4	76.9	81.8	80.5	77.3	70.0	61.3	51.8
Wilmington, N. C	Dec.,	1873	47.7	50.4	55.4	62.5	71.7	78.8	83.8	81.5	77.0	69.3	59.5	49.9
Smithville, N. C	Dec.,	1879	47.5	51.1	55.4	62.1	72.3	78.7	83.1	82.1	78.0	70.6	60.8	53.0
Charleston, S. C	Apr.,	1874	50.7	53.2	57.9	64.2	73.1	80.0	83.6	83.2	78.9	71.1	59.5	53.2
Savannah, Ga	Dec.,	1873	49.9	53.4	58.4	64.6	73.1	80.0	84.5	83.0	78.4	71.0	60.2	50.6
Jacksonville, Fla	Dec.,	1873	57.9	61.0	66.4	71.3	78.3	83.4	80.6	85.5	82.3	75.3	67.3	59.0
Key West, Fla	June,	1874	72.0	73.6	75.7	78.8	82.8	86.1	87.4	86.6	86.1	81.4	76.6	71.2
Cedar Keys, Fla	Dec.,	1879	59.9	63.7	66.6	72.6	79.0	83.4	85.9	85.6	84.2	76.9	66.8	60.6
Pensacola, Fla	Apr.,	1881	55.3	60.4	63.4	70.9	78.0	83.3	85.2	85.0	82.6	76.1	64.9	57.5
Mobile, Ala	Dec.,	1873	50.9	54.3	59.1	65.6	74.3	82.4	85.8	85.0	81.9	74.2	63.4	53.3
Galveston, Tex	Dec.,	1873	54.3	57.2	63.8	71.0	78.2	84.4	86.5	85.8	81.6	75.5	64.3	57.6
Indianola, Tex	May,	1874	52.8	58.6	65.4	71.9	78.1	84.6	86.5	86.9	82.8	77.2	65.9	59.6

APPENDIX 41.

Normal precipitation, and departure of 1885 therefrom, at stations of

[The normal has been computed from the commence

Districts and stations.	January. Normal.	January. Departure +or−.	February. Normal.	February. Departure +or−.	March.					
	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
New England:										
Eastport, Me	3.81	+0.55	4.13	−1.16	5.35	+0.59	2.80	+1.55	4.54	+0.22
Portland, Me	3.30	−0.28	3.26	+0.42	3.14	−1.55	2.98	−0.89	3.16	−1.25
Mount Washington, N. H	4.24	+1.25	3.99	−2.12	6.34	−5.39	5.59	−2.93	6.52	−4.22
Boston, Mass	4.26	+1.07	3.64	−0.64	4.71	−3.56	4.01	−0.71	3.52	+0.74
Block Island, R. I	5.28	+0.02	5.91	−2.23	4.03	−3.22	3.40	−0.75	4.89	−0.75
New Haven, Conn	4.22	−0.17	4.25	−1.10	4.89	−3.70	4.02	−1.71	3.60	−0.99
New London, Conn	4.21	+1.22	3.60	+0.37	4.82	−2.27	3.87	−0.53	3.56	+1.46
Middle Atlantic States.										
Albany, N. Y	2.77	+0.32	2.72	−1.84	2.75	−2.13	2.81	+0.08	2.87	−0.95
New York City	3.07	−0.17	3.55	+2.54	3.90	−2.71	3.16	−0.73	2.82	−0.08
Philadelphia, Pa	3.38	−0.40	3.19	−0.22	3.19	−2.60	3.00	−0.40	2.80	+0.87
Atlantic City, N. J	4.00	+0.27	3.34	−1.34	3.87	−2.92	3.49	−1.81	2.39	+1.22
Barnegat City, N. J.[1]	4.93	−0.59	3.52	−2.05	4.06	−4.43	3.56	−2.67	2.54	−1.07
Cape May, N. J.[2]	4.37	+0.61	3.79	−0.08	4.97	−2.68	3.16	−1.29	2.70	−2.60
Sandy Hook, N. J	4.32	+0.20	3.60	+0.94	4.90	−4.32	4.38	−1.91	3.97	+1.30
Baltimore, Md	3.17	−0.10	3.37	+1.03	3.94	−2.84	3.07	−1.70	2.95	+1.55
Washington City	3.41	+0.05	3.24	+1.30	4.09	−2.56	2.90	−1.19	2.98	−0.13
Cape Henry, Va	4.96	−1.60	3.60	+0.13	5.86	−3.38	5.16	−3.71	3.33	+1.60
Chincoteague, Va	4.91	+1.26	3.78	−1.78	4.01	−1.76	2.58	−1.61	3.42	+2.59
Lynchburg, Va	4.46	+5.31	3.44	+0.05	3.84	−2.66	3.40	−2.01	3.05	+2.31
Norfolk, Va	4.04	−0.01	3.90	−0.11	4.58	−1.54	3.97	−2.05	3.56	+2.60
South Atlantic States:										
Charlotte, N. C	6.50	+2.40	4.04	−0.10	5.27	−2.96	4.55	−1.72	3.33	+3.14
Hatteras, N. C	6.63	+1.35	5.19	−0.69	7.47	−3.75	5.64	−2.88	4.16	+2.86
Kitty Hawk, N. C	6.06	−0.01	3.97	+2.20	6.05	−2.57	5.69	−1.64	3.27	+2.46
Macon, Fort, N. C	6.05	+0.29	3.08	−0.09	5.89	−2.79	3.87	−1.54	4.15	+2.71
Smithville, N. C	3.96	−0.32	2.94	−1.24	3.96	−1.78	3.32	−1.41	3.06	+3.05
Wilmington, N. C	4.03	+1.15	3.38	−0.86	4.30	−2.25	3.34	−0.29	4.43	+4.15
Charleston, S. C	4.12	+2.76	3.60	−0.05	4.26	−2.52	4.67	−3.50	4.36	−2.16
Augusta, Ga	4.69	+2.86	3.93	−0.69	5.48	−3.63	4.83	−2.65	3.32	+2.54
Savannah, Ga	3.64	+2.81	3.13	−0.02	4.05	−0.94	4.54	−3.40	2.96	+1.09
Jacksonville, Fla	3.06	+3.52	3.50	+1.73	3.27	+2.39	3.30	−2.06	4.20	+2.54
Florida Peninsula:										
Cedar Keys, Fla	5.21	−0.24	3.75	+5.27	3.27	−0.20	2.50	−2.35	2.72	+1.76
Key West, Fla	2.40	+1.69	1.98	+2.00	0.66	+0.33	1.33	−0.66	3.98	−1.50
Sanford, Fla	1.80	−1.20	2.79	+1.17	2.35	+2.25	3.95	−2.43	3.01	+1.96
Eastern Gulf States:										
Atlanta, Ga	7.34	+1.10	5.73	−1.59	6.74	−2.46	5.18	−3.67	3.30	+2.99
Pensacola, Fla	5.69	+2.53	4.27	−1.07	4.40	+0.14	5.08	+0.41	4.39	−2.96
Mobile, Ala	5.41	+6.54	4.47	−1.63	7.77	−1.41	5.97	−0.78	4.85	−1.68
Montgomery, Ala	4.98	+4.74	5.35	−1.67	6.48	−3.55	6.27	−2.35	4.11	+4.81
Vicksburg, Miss	6.65	+2.04	5.22	−1.29	6.50	−4.67	7.06	+1.94	5.69	−0.94
New Orleans, La	5.72	+3.96	4.15	−1.76	6.00	+0.99	6.17	−2.50	5.54	+0.22
Western Gulf States:										
Shreveport, La	5.28	+6.63	5.07	−1.76	4.79	−3.00	6.09	+0.99	5.12	−1.46
Fort Smith, Ark	2.02	−0.03	6.01	−4.32	1.72	−0.04	4.80	+2.77	3.98	−1.39
Little Rock, Ark	4.70	−0.29	7.62	−5.19	4.83	−0.99	6.24	−0.21	6.44	−3.16
Galveston, Tex	4.11	+2.80	2.66	−0.82	3.14	+0.03	3.90	+0.82	4.56	+1.83
Indianola, Tex	2.30	+4.10	1.62	−0.13	2.55	−0.60	1.81	+3.28	3.49	+1.78
Palestine, Tex	4.62	+3.15	3.30	−0.28	3.40	−1.15	4.85	+0.29	3.44	−2.96
San Antonio, Tex	1.34	([3])	1.83	([3])	2.39	+1.48	3.15	+1.97	3.83	+4.09
Rio Grande Valley:										
Brownsville, Tex	2.16	+1.69	1.77	+0.75	1.25	+0.29	0.65	+0.02	3.43	+3.74
Rio Grande City, Tex	1.21	+1.15	1.07	+0.05	1.04	−0.63	1.06	+1.44	3.59	+6.09
Ohio Valley and Tennessee:										
Chattanooga, Tenn	8.01	+0.48	5.38	−1.88	6.25	−4.46	5.24	−3.64	3.78	+1.34
Knoxville, Tenn	6.06	+1.58	5.01	−2.04	5.74	−2.64	5.52	−3.59	3.81	+3.68
Memphis, Tenn	5.05	+0.66	5.16	−3.28	5.96	−2.99	6.30	−3.39	4.74	−1.69

[1] Station closed December 31, 1885. [2] Station closed October 31, 1885. [3] No record.

APPENDIX 41.

the Signal Service, United States Army, for each month of the year.

ment of observations to December, 1885, inclusive. [

No record.

Normal precipitation, and departure of 1885 *therefrom, at stations of the*

Districts and stations.	January.		February.		March.		April.		May.	
	Normal.	Departure + or —.	Normal.	Departure + or —.	Normal.	Departure + or —.	Normal.	Departure + or —.	Normal.	Departure + or —.
	In.	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*
Ohio Valley and Tennessee—Cont'd:										
Nashville, Tenn	5.24	+1.05	5.31	—3.31	5.25	—2.92	5.53	—1.78	3.65	+0.71
Louisville, Ky	4.23	+2.11	4.71	—1.83	4.13	—3.11	4.60	+0.84	3.94	+0.26
Greencastle, Ind	3.26	±0.00	2.01	±0.00	0.66	±0.00	4.61	±0.00	3.37	±0.00
Indianapolis, Ind	2.83	+0.48	3.02	—2.08	3.91	—3.09	3.57	+1.71	4.25	—0.59
Cincinnati, Ohio	3.60	+2.20	3.99	—1.33	3.64	—3.08	3.23	+0.11	3.55	—1.48
Columbus, Ohio	3.18	+0.57	3.86	—1.47	3.18	—2.65	3.21	+1.40	4.70	+1.13
Pittsburg, Pa	3.09	+0.94	2.50	—0.60	2.96	—1.82	2.50	+0.29	2.78	+0.48
Lower Lakes:										
Buffalo, N. Y	2.69	+0.41	2.47	—0.90	2.88	—1.35	2.43	+1.04	3.04	+0.76
Oswego, N. Y	3.09	—1.07	2.49	—1.27	3.05	—2.57	1.99	—0.13	2.82	+0.55
Rochester, N. Y	3.33	—1.23	2.55	—1.01	3.24	—2.28	2.55	+0.41	3.15	—1.13
Erie, Pa	3.45	+0.15	3.26	—1.10	3.08	—1.25	2.50	—0.25	3.67	+1.23
Cleveland, Ohio	2.45	+0.18	2.69	—1.64	2.92	—2.05	2.45	+0.07	3.25	+0.63
Sandusky, Ohio	2.21	+1.08	3.14	—2.81	2.68	—1.93	2.52	—0.83	3.54	+0.81
Toledo, Ohio	2.16	+0.96	1.92	—1.31	2.15	—1.52	2.28	+0.13	3.83	+1.78
Detroit, Mich	2.12	—0.23	2.40	—1.14	2.67	2.01	2.28	—0.45	3.63	+0.02
Upper Lakes:										
Alpena, Mich	2.12	—0.03	2.11	—0.48	1.97	—0.72	1.85	+0.43	3.80	—1.62
Escanaba, Mich	1.28	+0.06	1.37	—0.44	1.74	+0.49	1.93	+1.23	3.90	—0.29
Grand Haven, Mich	2.38	+0.82	2.10	—0.53	2.50	—1.48	2.62	—1.24	3.42	—2.25
Mackinaw City, Mich	5.88	—1.49	3.89	—0.30	1.31	—0.10	1.19	+0.69	2.90	—0.37
Marquette, Mich	1.27	+1.50	1.40	(1)	1.40	+0.74	1.72	+0.24	3.00	+0.19
Port Huron, Mich	2.01	+0.86	2.49	+0.90	3.57	—2.86	2.16	—0.90	3.11	+0.69
Chicago, Ill	2.07	+1.11	2.32	—0.31	2.60	—2.23	3.63	+0.87	3.81	—0.64
Milwaukee, Wis	1.90	—0.80	1.87	—1.38	2.05	—2.44	2.96	—0.64	3.43	—3.02
Duluth, Minn	0.98	—0.37	1.09	—0.77	1.59	—0.82	2.08	—1.19	3.86	—2.33
Upper Mississippi Valley:										
Saint Paul, Minn	0.98	—0.68	1.02	—0.82	1.55	—1.00	2.16	+1.03	3.51	—1.39
La Crosse, Wis	1.40	—0.69	1.12	—0.84	1.70	—1.19	2.03	—0.18	3.36	—0.84
Davenport, Iowa	1.70	+0.40	1.53	—0.35	2.20	—2.03	3.03	—0.56	4.28	—2.34
Des Moines, Iowa	1.02	—0.02	1.54	—1.12	1.33	—1.29	2.78	+0.84	5.53	—3.83
Dubuque, Iowa	1.46	+0.34	1.52	—0.80	2.28	—1.87	2.97	+0.72	3.90	—1.28
Keokuk, Iowa	1.66	+0.78	1.71	—0.57	2.22	—2.05	3.12	+0.21	4.07	—1.48
Cairo, Ill	4.19	—0.70	4.34	—2.86	3.97	—2.89	4.11	—2.68	4.27	—1.06
Springfield, Ill	2.05	+0.76	4.00	—3.06	2.83	—2.66	3.72	+2.64	5.40	—2.62
Saint Louis, Mo	2.17	+1.09	3.04	—2.17	2.86	—2.46	3.50	+1.34	3.71	—0.91
Missouri Valley:										
Leavenworth, Kans	1.33	+0.14	1.53	—0.66	2.34	—2.03	3.87	+2.76	5.11	+0.78
Omaha, Nebr	0.55	—0.14	0.83	—0.36	1.50	—1.17	3.55	+2.79	4.98	—0.55
Bennett, Fort, Dak.[2]	0.73	—0.59	0.64	—0.43	1.01	—0.88	2.20	—0.36	2.58	—0.18
Huron, Dak	0.14	+0.01	0.38	—0.16	0.72	—0.60	2.52	—1.46	4.26	+0.24
Sully, Fort, Dak	0.57	—0.20	0.31	—0.01	0.91	—0.85	1.59	+0.79	2.78	—0.08
Yankton, Dak	0.57	—0.04	0.84	—0.41	1.12	—0.87	3.26	+1.82	4.54	—0.53
Extreme Northwest:										
Moorhead, Minn	0.74	—0.72	1.01	—0.93	1.03	—0.72	1.75	+1.68	3.15	—0.88
Saint Vincent, Minn	0.33	—0.01	0.39	—0.29	0.54	—0.08	1.22	+1.63	2.35	—0.76
Bismarck, Dak	0.54	—0.22	0.65	—0.29	1.06	—0.88	2.80	+0.32	3.02	—2.10
Buford, Fort, Dak	0.73	—0.09	0.49	—0.05	0.45	—0.42	1.34	+0.37	2.01	—0.99
Totten, Fort, Dak	0.22	—0.05	0.42	—0.17	0.42	—0.27	2.72	+0.35	1.45	+0.25
Northern Slope:										
Assinaboine, Fort, Mont	1.19	—0.36	0.58	+0.20	0.64	—0.51	0.79	—0.41	1.28	—0.85
Benton, Fort, Mont	0.82	+0.12	0.51	+0.09	0.73	—0.83	0.84	—0.20	2.60	—2.12
Custer, Fort, Mont	1.12	—1.04	0.44	—0.28	0.48	—0.24	1.06	—0.55	2.75	—2.28
Helena, Mont	1.91	—0.60	0.75	+0.07	0.88	—0.10	1.22	—0.22	1.07	—0.22
Maginnis, Fort, Mont	1.32	—0.14	0.77	+0.27	0.91	—0.21	0.67	+0.34	0.97	—0.54
Poplar River, Mont	0.53	+0.28	0.49	+0.15	0.37	—0.85	0.77	±0.00	1.48	—0.71
Shaw, Fort, Mont	1.31	+0.56	0.53	+0.25	0.52	—0.17	0.69	—0.09	1.53	—0.71
Deadwood, Dak	1.01	+0.59	1.19	+1.69	1.97	+1.84	4.81	—1.70	5.16	—1.94
Cheyenne, Wyo	0.27	—0.11	0.22	+1.39	0.56	—0.05	1.24	+2.52	2.26	—0.93
North Platte, Nebr	0.56	—0.44	0.37	—0.21	0.61	—0.24	1.82	—0.23	3.11	+0.29
Middle Slope:										
Denver, Colo	0.64	—0.23	0.46	+0.27	0.87	+0.10	2.06	+2.88	3.10	—0.97
Pike's Peak, Colo	1.52	—0.91	1.50	+2.41	1.89	—1.01	3.50	+1.89	4.19	+1.93
West Las Animas, Colo	0.21	+0.01	0.34	—0.02	0.45	—0.09	0.85	—0.40	2.88	—2.39
Dodge City, Kans	0.28	+0.24	0.54	—0.07	0.81	—0.06	1.25	+0.14	4.32	—0.25
Elliott, Fort, Tex	0.31	+0.14	0.34	+0.43	0.53	+1.33	1.44	+3.23	5.88	+1.35
Southern Slope:										
Sill, Fort, Ind. T	1.10	—0.60	1.77	—0.67	1.35	±0.00	2.46	+0.16	5.10	+0.44
Concho, Fort, Tex.[3]	1.14	+0.16	1.14	—0.73	1.30	+0.44	2.22	+1.94	4.22	—1.52
Davis, Fort, Tex	0.63	+0.06	0.19	+0.09	0.41	+0.87	0.58	—0.12	1.59	+0.38
Stockton, Fort, Tex	0.31	+0.18	0.84	+0.07	1.38	+6.40	0.45	+0.28	1.51	+0.98

[1] No record. [2] Station closed November 30, 1885. [3] September 15, 1885.

Signal Service, United States Army, for each month of the year—Continued.

June.		July.		August.		September.		October.		November.		December.	
Normal.	Departure +or—.	Normal.	Departure +or—.	Normal.	Departure +or—.	Normal.	Departure +or—.	Normal.	Departure +or—.	Normal.	Departure +or—.	Normal.	Departure +or—.
In.	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*
4.17	-0.45	5.02	+0.24	3.26	-2.24	3.49	+2.11	3.01	-0.02	3.82	-1.09	3.78	-0.88
4.39	-1.21	4.22	-2.21	3.51	-0.54	2.98	+2.73	3.50	+1.47	3.76	+2.41	4.41	-1.57
8.64	±0.00	4.22	±0.00	7.24	±0.00	6.01	±0.00	2.47	+1.20	2.14	+0.40	5.31	-1.43
5.47	+0.27	5.51	-4.08	3.29	+2.53	2.68	-0.82	3.37	-0.12	3.65	-0.94	3.45	-1.00
4.74	-0.76	3.92	-2.52	4.08	+0.87	2.32	+0.40	2.94	-0.64	3.25	-0.92	3.83	-2.01
3.99	+1.09	3.66	-0.38	3.87	+2.03	2.52	+0.32	3.47	-0.36	3.31	-0.23	3.56	-1.71
3.51	-0.83	4.65	-2.16	3.32	+2.32	2.59	-0.90	2.66	+1.63	2.45	+0.12	2.93	-1.29
3.37	+3.02	3.67	-0.04	3.43	+7.20	3.16	+1.72	3.90	+2.23	3.43	-0.77	3.46	+1.05
3.38	+0.56	3.38	+1.51	2.44	-0.07	2.56	+1.06	3.46	-0.13	3.19	-1.02	3.67	+0.20
3.32	+0.95	3.42	-0.68	2.95	-0.75	2.34	+0.15	3.21	-0.55	2.76	-0.66	2.00	-0.74
4.17	+2.67	3.36	-1.83	3.40	+4.57	4.25	-0.83	4.55	+3.02	4.57	+1.26	3.42	-0.23
4.45	+2.77	4.29	+0.19	3.41	+1.73	3.77	-1.76	3.10	+0.68	2.60	+1.98	2.60	-1.01
4.90	+1.71	4.16	-1.08	4.03	-0.16	3.31	-1.49	3.18	-0.26	3.28	-0.53	2.78	-1.01
3.68	-0.32	3.68	-1.19	2.94	+0.66	2.44	-0.27	2.81	-0.80	2.88	+0.22	2.51	+0.38
3.78	-0.42	4.03	-1.20	2.98	+2.07	2.60	-1.06	2.73	-1.05	2.48	-0.29	2.77	-0.47
3.86	-2.12	3.46	-0.04	3.73	+3.45	4.50	-0.83	4.66	-0.26	2.86	-0.30	2.39	+0.73
4.60	-2.06	3.86	-1.22	4.18	+1.07	4.21	-2.52	3.87	-1.52	2.68	+0.73	1.84	+1.54
4.62	+1.02	3.39	-0.26	3.00	+1.82	3.97	+0.74	4.01	+0.11	3.18	-1.55	2.63	+0.77
2.58	-0.70	3.47	+0.08	2.67	+0.11	1.81	-1.12	2.91	-0.87	3.03	-0.82	4.05	-2.32
4.08	-0.74	3.25	-1.40	3.10	-0.03	4.95	-3.95	3.77	-0.86	2.45	+1.65	2.08	-0.21
4.01	+1.28	2.94	+0.06	2.82	+0.46	2.45	-0.39	3.17	-0.65	2.70	+0.40	2.43	+0.10
4.35	+0.85	3.84	-1.40	3.23	+8.05	2.79	+0.18	3.84	+0.03	2.84	-0.51	2.30	+1.05
4.23	+2.26	3.45	+0.78	3.09	+4.30	3.14	+0.16	2.77	-0.37	2.09	-0.56	1.80	+0.82
5.33	-0.51	4.06	-0.60	3.49	-0.98	4.43	-2.08	2.98	-2.19	1.73	-0.36	1.33	-0.79
4.94	-1.21	3.38	+2.48	3.76	-0.07	3.36	+0.16	2.14	-1.21	1.32	-0.72	1.20	-0.65
4.75	+0.17	ç.29	+3.22	3.65	±0.00	5.09	-0.31	2.58	-2.28	1.89	-1.29	1.33	+0.04
4.80	-2.72	3.78	-2.12	4.21	+8.47	3.35	+0.84	3.09	-0.88	2.05	-0.85	1.70	+0.25
7.91	-2.88	4.36	+2.19	3.88	+1.22	3.39	+1.43	4.65	-0.47	2.35	-1.74	1.59	+0.37
5.69	+0.47	5.38	+0.97	3.84	+4.18	4.87	-0.29	3.14	-0.82	2.20	-1.66	1.90	+1.24
5.61	-1.36	4.51	-2.22	3.08	+2.90	3.65	+0.12	3.56	+0.03	2.01	-1.13	2.25	-0.29
4.53	+0.10	4.04	-3.22	2.76	-0.36	2.72	+2.04	3.29	-0.40	3.94	-1.15	3.68	-0.67
6.49	-2.21	2.54	-0.72	2.87	+1.95	3.43	+1.04	4.60	+1.70	3.21	-1.77	3.26	-0.74
4.99	-2.69	4.14	-1.56	2.50	+0.46	3.21	+5.77	3.07	+4.44	2.63	-0.95	2.42	-0.39
5.59	-1.59	5.08	-0.62	3.43	+1.77	3.55	+4.10	3.42	+0.81	2.44	-0.58	1.67	-0.70
6.46	-3.79	6.17	+3.07	3.59	+0.94	3.53	-1.03	3.15	+0.71	1.32	-0.59	1.01	+0.16
3.97	+1.05	2.17	-0.62	2.21	+3.66	1.24	+0.23	0.69	-0.55	0.29	-0.01	0.45	([1])
4.70	+0.73	4.86	-0.34	2.92	+0.97	1.90	+0.71	1.90	-1.01	0.56	+0.94	0.32	-0.22
3.56	+1.56	2.50	+0.21	2.02	+2.48	1.19	+0.58	0.70	-0.58	0.43	+0.22	0.46	-0.32
4.94	-2.04	3.98	-2.01	2.87	+3.34	2.89	+1.91	1.76	-0.52	0.53	+2.16	0.70	-0.63
4.62	+3.30	4.42	-1.08	3.84	-2.37	2.64	-0.44	2.88	-2.20	1.02	-0.38	0.82	-0.50
2.68	+0.24	2.74	+1.08	3.13	-2.18	1.95	-0.97	2.43	-2.50	0.56	+0.56	0.56	-0.02
3.53	-1.14	2.36	+0.05	2.71	-1.09	1.32	-1.18	1.23	-0.09	0.71	-0.05	0.77	-0.43
3.16	+2.89	2.56	+0.46	1.19	+0.31	0.78	-0.52	0.84	-0.65	0.39	+0.17	0.86	-0.72
2.98	+0.47	4.44	+1.39	2.82	-0.91	0.72	-0.59	0.79	-0.13	0.58	+0.32	0.48	-0.01
2.18	([1])	3.26	-1.70	1.90	-0.45	1.28	-1.11	0.55	-0.49	0.95	-0.79	0.74	-0.83
2.23	+3.87	1.90	+0.92	1.12	+0.69	1.02	-0.77	0.79	-0.42	0.78	-0.13	0.64	-0.26
2.79	+1.39	1.15	-0.30	1.23	+0.37	0.74	-0.06	0.24	+0.64	0.24	+0.22	0.09	+0.83
2.61	+1.85	1.32	-0.16	0.85	-0.37	1.51	-1.40	1.00	-0.84	0.59	-0.44	1.38	-1.17
2.19	+2.22	0.60	+0.28	0.81	+0.13	0.70	+0.43	1.45	-0.82	0.62	+0.05	0.80	+0.14
1.84	+2.67	1.80	+1.25	0.72	-0.30	0.64	-0.49	0.89	-0.80	0.32	-0.03	0.31	+0.10
2.84	+0.49	1.07	+0.90	0.99	+0.36	1.52	-1.27	1.02	-0.08	0.58	-0.55	0.81	-0.04
4.20	+0.63	2.35	-0.91	2.03	-0.83	0.81	+0.09	1.57	+0.12	1.11	+0.29	1.50	-0.32
1.51	+1.24	1.72	+0.19	1.51	+0.63	0.88	-0.19	0.72	-0.44	0.31	+0.80	0.21	-0.05
3.73	+0.06	2.97	+0.15	2.52	+2.35	1.35	-0.49	1.32	-0.14	6.44	+1.27	0.77	+0.18
1.52	-0.86	1.76	-0.43	1.53	-0.35	0.92	+0.30	0.74	-0.01	0.69	-0.14	0.74	+0.34
1.79	-0.50	4.38	-1.71	3.93	-1.94	1.86	-0.82	1.49	+0.04	1.86	-0.99	1.48	+2.55
2.51	-0.37	1.70	+1.01	2.12	+1.63	0.60	+0.39	0.64	+0.55	0.31	+0.39	0.85	+0.06
2.97	-0.95	3.63	+2.40	3.30	-1.50	1.29	+2.19	1.32	-0.26	0.63	-0.27	0.80	+0.96
4.08	+5.74	3.14	+0.48	3.47	+1.47	2.23	-1.58	2.81	-2.21	0.65	-0.40	1.02	+1.09
5.42	+2.74	3.03	-1.64	2.74	+2.98	2.73	+0.10	2.37	-1.30	1.94	-0.06	2.13	-0.55
2.67	+1.83	3.47	-1.88	3.55	-1.64	4.36	([1])	2.90	([1])	1.31	([1])	1.47	([1])
2.24	-1.07	3.58	-1.08	5.27	-1.93	2.08	-0.50	2.14	-1.44	0.45	-0.44	0.39	-0.15
2.15	+0.71	1.99	-0.63	2.52	-1.91	5.24	-4.02	1.56	-0.44	0.70	-0.56	0.70	([1])

[1] No record. [2] Station closed September 15, 1885.

Normal precipitation, and departure of 1885 *therefrom, at stations of the*

Districts and stations.	January. Normal.	January. Departure + or −.	February. Normal.	February. Departure + or −.	March. Normal.	March. Departure + or −.	April. Normal.	April. Departure + or −.	May. Normal.	May. Departure + or −.
	In.	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*
Southern Plateau:										
....	0.60	−0.24	0.63	−0.10	0.50	+0.92	0.63	+0.75	0.69	+0.42
....	0.62	−0.50	0.45	−0.42	0.12	−0.18	0.21	−0.17	0.46	+0.61
is	1.18	−0.66	1.86	−0.86	1.84	+0.21	0.78	−0.26	0.65	+0.47
....	0.72	−0.41	1.26	−0.24	1.42	−0.02	0.22	−0.18	0.41	−0.16
....	0.98	−0.90	1.35	−0.69	1.42	+0.05	0.89	−0.37	0.54	−0.17
is	0.41	−0.38	1.82	−0.82	1.44	−0.69	0.26	−0.12	0.34	−0.25
....	0.84	−0.84	0.57	−0.55	0.21	−0.21	0.09	−0.02	0.05	−0.05
r	1.13	−0.34	1.02	+0.89	0.79	−0.59	1.02	−0.02	0.98	+0.60
tah	1.84	+0.14	1.39	+0.17	2.06	+0.58	2.53	+0.94	2.17	+0.32
....	2.31	−0.81	1.82	+0.47	1.30	−1.27	1.06	−0.97	1.28	+1.86
....	2.27	−0.60	2.02	+0.86	1.07	−0.54	1.12	−0.93	1.33	+1.60
....	3.04	−1.35	3.99	−0.25	1.66	−1.61	2.58	−2.52	1.99	+1.00
ash	2.75	−0.22	2.87	−0.60	1.02	−0.80	1.61	−1.24	1.25	+0.28
h	6.56	+0.12	8.20	+3.00	1.66	−0.51	2.05	−0.92	2.38	+1.07
....	8.48	−2.25	9.48	−1.81	4.90	−4.40	3.76	−3.37	2.61	+0.27
Wash	13.90	+0.57	9.65	+3.62	2.38	−0.04	1.84	−1.47	4.96	+0.59
....	6.88	−2.81	7.78	−1.06	6.43	−5.80	3.82	−2.20	2.52	+2.17
....	6.03	−3.04	4.82	+0.46	3.49	−3.21	2.78	−1.57	[illegible]	+1.06
Cal.	2.03	−0.12	2.06	−0.60	1.85	−1.51	2.39	−1.47	[illegible]	−0.25
....	5.55	−3.71	4.06	−2.67	3.10	−3.19	[illegible]	−3.16	1.13	−0.49
....	3.75	−1.59	3.41	−2.92	3.34	−3.26	3.40	−2.72	0.69	−0.69
l	4.53	−2.30	3.88	−3.55	2.11	−2.10	2.19	+0.06	0.64	−0.60
....	2.06	−1.01	3.76	−3.75	3.01	−3.00	2.00	+0.01	[illegible]	−0.45
....	1.71	−1.30	[illegible]	−2.40	1.34	−0.56	0.87	+0.33	[illegible]	+0.19
....	3.90	−2.64	0.80	−0.89	3.13	−0.68	1.79	+1.62	2.45	+0.67
ort	0.91	−0.53	0.17	+0.14	0.46	+0.61	0.54	+0.22	0.93	+0.11
....	10.23	−0.41	9.82	+0.04	10.66	+1.43	5.86	+7.54	4.72	−1.17
....	13.48	+16.20	7.68	−3.26	6.77	+1.65	6.41	+5.99	4.64	−3.17
ring Sea	0.71	−0.13	1.62	−1.23	0.77	−0.52	1.02	−0.22	0.96	+0.22

[1] Station closed December 31, 1885. [2] Station closed November 30, 1885.

Signal Service, United States Army, for each month of the year—Continued.

June.		July.		August.		September.		October.		November.		December.	
Normal.	Departure +or—.	Normal.	Departure +or—.	Normal.	Departure +or—.	Normal.	Departure +or—.	Normal.	Departure +or—.	Normal.	Departure +or—.	Normal.	Departure +or—.
In.	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*
1.18	+0.39	3.22	—2.09	2.84	—1.86	1.30	+0.57	1.03	+0.04	0.92	+0.09	0.86	+1.41
0.47	+2.16	8.01	—1.95	2.28	—1.82	1.22	—1.00	1.44	—0.98	0.47	—0.16	0.74	—0.37
1.00	—0.16	4.05	—1.45	4.74	—1.58	1.58	—1.14	1.07	—1.29	1.06	+0.50	2.15	—0.74
0.80	—0.07	8.34	—2.41	3.33	—1.75	1.23	—0.42	0.93	—0.90	0.62	+0.68	1.73	—0.92
0.16	—0.09	2.17	+0.36	3.08	—1.84	1.14	—1.03	0.58	—0.20	0.89	+1.77	1.88	—1.56
0.42	—0.24	1.84	+1.09	2.41	+0.05	0.55	—0.53	0.30	—0.29	0.34	+0.04	1.51	—0.80
(3)	(3)	0.18	—0.13	0.32	+0.54	0.07	—0.07	0.04	—0.04	0.18	+1.53	0.44	—0.43
1.00	+1.41	0.11	—0.11	0.10	—0.06	0.35	—0.27	0.55	—0.48	0.95	+2.83	1.23	—0.23
0.84	+1.83	0.59	—0.01	0.85	+0.05	0.88	+0.41	1.70	—1.11	1.61	+1.49	1.43	—0.51
0.96	+0.12	0.20	+0.03	0.09	±0.00	0.57	—0.18	1.51	—0.93	0.88	+1.19	2.21	—1.14
2.38	+2.53	0.74	—0.62	0.32	+0.09	0.63	+0.03	1.75	—1.04	1.52	+0.61	8.10	—0.80
1.28	+0.92	0.58	—0.57	0.35	—0.28	0.87	—0.28	2.54	—1.81	2.19	+0.52	4.98	(3)
1.80	+1.60	0.92	—0.53	0.29	—0.13	1.35	—0.47	2.26	—1.46	2.30	+1.95	2.20	—0.45
2.74	+0.59	0.98	—0.76	0.68	—0.56	4.20	—0.86	5.12	—1.64	8.70	+5.02	7.45	+3.11
1.16	—0.37	0.86	+0.24	0.75	—0.75	3.07	+0.62	5.15	—2.31	7.63	+2.55	9.10	—3.47
2.88	—1.11	0.95	—0.78	2.80	—2.68	7.88	+1.72	6.95	+0.56	13.96	+5.29	11.02	—0.88
1.79	—0.02	0.75	—0.51	0.72	—0.72	1.87	+0.61	4.65	—2.97	7.17	+1.85	8.15	—0.98
1.08	+0.45	1.08	—1.01	0.43	—0.43	0.38	—0.02	2.77	—1.11	8.92	+4.18	6.33	+0.19
0.75	+0.57	0.26	+0.06	0.29	+0.53	1.10	+0.40	1.58	—0.47	2.88	+4.46	2.51	+0.20
0.41	+0.96	0.02	+0.03	0.03	—0.03	0.70	+2.21	1.28	—1.18	3.85	+13.20	5.19	—1.33
0.29	—0.18	(4)	±0.00	(4)	(4)	0.30	—0.22	0.93	—0.91	2.30	+9.04	4.24	+1.52
0.32	—0.13	0.01	+0.05	0.01	—0.01	0.16	—0.05	1.20	—0.48	3.14	+8.64	4.93	+0.06
0.19	—0.19	(4)	±0.00	(4)	±0.00	0.01	+0.04	0.56	—0.26	1.47	+4.08	3.67	—2.02
0.07	—0.01	0.02	—0.02	0.20	—0.07	0.05	—0.05	0.47	—0.16	0.72	+0.84	2.22	—1.51
1.88	+0.83	4.13	—0.70	4.48	+4.51	4.98	—0.82	1.99	+0.14	2.84	—2.41	1.30	+0.16
1.36	+2.15	1.75	+1.31	2.61	+1.95	2.90	+0.49	1.34	+0.28	0.79	—0.82	0.07	+0.08
3.10	—0.74	5.22	—1.37	5.68	—1.68	10.29	—1.96	11.22	+2.33	12.81	—2.66	11.48	+0.22
4.26	—2.23	2.78	+1.87	3.40	—0.06	8.64	—1.00	11.98	+5.62	9.30	—0.55	11.81	—3.73
1.66	—0.03	2.46	+1.59	2.09	+0.06	2.50	+0.82	2.60	—1.26	2.96	+1.12	1.62	—0.01

[3] No record.

[4] Inappreciable.

APPENDIX 42.

Monthly and annual precipitation, from reports made by voluntary observers of the Signal Service, United States Army, for the year ending December 31, 1885.

Stations.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
	In.	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*
Accotink, Va	4.00	3.70	1.22	1.61	2.34	2.35	1.78	3.56	1.48	6.97	2.88	1.96	33.85
Aiken, S. C	8.16	3.97	2.46	2.19	8.03	([1])	([1])	([1])	([1])	([1])	1.03	2.78	......
Albany, Oreg	4.20	5.82	0.81	1.38	3.93	1.95	([1])	0.00	2.13	1.75	8.40	7.04	......
Albion, Idaho	0.30	2.00	0.19	0.30	2.34	1.02	([1])	([1])	([1])	([1])	([1])	([1])	......
Allison, Kans	0.32	1.14	0.68	2.22	1.60	2.01	4.01	2.05	1.96	2.31	0.52	2.12	20.94
Altoona, Pa	3.92	1.59	0.44	1.83	1.51	1.54	2.09	5.67	0.82	3.61	1.92	1.73	26.67
Amherst (Agri. Sta.) Mass	3.78	3.88	0.86	3.38	3.08	3.49	2.07	8.31	0.85	2.65	5.54	3.54	42.43
Amherst, Mass	4.21	3.38	1.25	3.49	2.25	3.10	1.80	7.62	0.67	4.12	5.65	3.90	41.44
Anna, Ill	4.64	1.22	1.43	2.69	2.24	6.89	2.19	4.13	4.54	3.43	1.80	2.93	38.13
Ann Arbor, Mich	2.54	1.40	1.28	3.47	3.72	3.94	2.05	([1])	([1])	([1])	([1])	([1])	......
Antrim, N. H	([1])	([1])	([1])	3.30	2.90	3.20	2.40	6.00	2.45	3.90	6.50	4.35	......
Archer, Fla	8.18	6.90	3.75	0.27	6.63	11.45	5.91	10.23	11.62	4.77	1.41	5.61	76.73
Ashland, N. H	5.69	2.91	1.87	2.25	1.89	4.56	5.53	6.51	1.63	3.84	5.71	5.15	47.54
Asheville, N. C	4.20	([1])	([1])	1.10	3.90	2.02	([1])	([1])	([1])	8.30	4.80	([1])	......
Ashwood, Tenn	5.00	2.40	2.70	3.00	3.90	4.10	3.60	3.60	4.71	3.23	3.10	3.77	42.71
Atchison, Kans	1.27	0.91	0.25	5.30	3.10	5.20	3.77	4.05	4.60	3.75	1.07	1.10	34.37
Athens, Ga	7.88	4.86	3.37	1.07	7.22	4.40	5.28	7.05	8.65	4.89	3.71	2.86	61.24
Auburn, N. Y	5.78	3.56	1.33	2.61	2.46	3.10	4.64	6.83	3.48	3.95	2.38	2.78	42.40
Austin, Tenn	5.87	2.06	1.59	2.55	4.78	2.93	4.51	([1])	([1])	3.21	2.73	2.98	......
Austin, Tex	5.37	([1])	2.22	4.71	([1])	0.63	1.68	1.66	([1])	2.82	1.17	2.69	......
Bainbridge Island, Wash	1.01	5.40	0.77	0.25	3.35	0.35	0.82	0.01	4.27	4.40	8.04	6.22	34.89
Bandon, Oreg	6.82	12.42	([1])	0.97	2.10	1.78	([1])	0.02	2.32	2.45	18.21	13.27	......
Belmont, N. H	5.06	4.09	1.42	2.09	1.93	3.40	1.54	5.95	0.97	2.39	4.70	4.46	38.00
Beloit, Wis	1.96	1.21	0.21	3.75	1.54	5.37	2.99	9.23	4.56	([1])	([1])	([1])	......
Bethel, Conn	5.06	3.61	1.32	2.71	1.65	1.70	4.44	5.80	0.70	4.75	6.50	2.90	41.14
Bird's Nest, Va	5.20	3.40	3.00	2.05	7.85	1.50	4.45	7.05	3.00	2.35	5.80	3.15	48.80
Birmingham, Ala	([1])	([1])	([1])	([1])	6.48	([1])	([1])	([1])	([1])	([1])	([1])	3.40	......
Birmingham, Mich	([1])	([1])	0.89	2.91	3.52	3.63	4.49	([1])	2.11	1.61	2.66	2.62	......
Blooming Grove, Pa	1.50	([1])	0.95	2.22	2.00	1.60	2.30	9.20	1.06	7.70	3.20	2.10	......
Blue Hill, Mass	([1])	1.18	0.78	2.91	4.19	2.63	1.50	6.28	1.88	5.92	4.35	2.20	......
Blue Lake, Cal	8.79	8.39	1.45	3.30	1.34	1.57	0.00	0.00	0.93	1.65	31.99	13.70	73.11
Boyne, Mich	([1])	([1])	2.32	2.67	4.03	1.19	3.61	([1])	1.56	([1])	2.33	([1])	......
Brattleborough, Vt	([1])	([1])	([1])	3.13	2.92	2.46	2.40	6.34	1.36	4.74	5.64	2.75	......
Bristol, N. H	5.79	3.54	1.74	2.16	2.15	3.01	3.79	8.58	1.84	3.65	6.52	2.44	45.21
Bruington, Va	([1])	([1])	2.10	2.25	4.42	3.89	2.43	5.14	1.14	4.55	3.06	4.09	......
Bunker Hill, Ill	3.09	0.87	0.42	4.27	1.98	8.22	2.29	3.96	5.73	4.89	1.85	2.42	39.49
Burlington, Vt	2.36	1.40	0.86	2.53	2.48	2.52	3.80	3.41	3.50	4.77	3.94	2.07	33.64
Cahuenga, Cal	0.84	0.00	0.12	2.19	0.10	0.00	0.00	([2])	0.00	0.06	7.45	1.65	12.41
Carson City, Nev	0.40	0.18	0.31	3.41	0.07	0.46	0.00	0.10	0.06	0.12	4.73	1.75	11.59
Carthage, Mo	([1])	([1])	1.45	7.38	4.40	5.36	4.31	4.30	([1])	1.90	0.84	1.64	......
Catawissa, Pa	4.13	3.13	1.04	2.43	2.68	2.22	3.26	7.36	0.97	5.65	4.65	2.33	39.85
Cedar Rapids, Iowa	2.15	3.26	0.61	7.82	5.92	3.46	6.35	([1])	2.84	2.50	0.65	1.48	......
Centreville, Mo	([1])	([1])	([1])	([1])	([1])	10.73	5.53	([1])	6.26	1.71	2.72	2.55	......
Chambersburg, Pa	3.62	3.47	0.91	2.85	1.20	2.20	0.78	5.64	0.93	4.64	1.51	1.05	28.30
Chapel Hill, N. C	5.24	2.73	3.50	2.71	4.34	([1])	3.95	([1])	([1])	([1])	([1])	([1])	......
Charleston, Ill	([1])	0.96	0.12	4.74	3.10	4.98	2.83	6.47	4.49	3.24	2.61	3.34	......
Charlotte, Vt	4.30	2.70	0.50	2.50	2.80	5.20	5.00	5.90	5.70	7.20	5.20	2.20	49.20
Chester, Minn	([1])	([1])	0.85	1.88	1.79	4.37	([1])	([1])	([1])	([1])	([1])	([1])	......
Cincinnati, Ohio	4.26	2.45	0.70	3.32	2.99	3.52	([1])	([1])	3.06	3.05	2.57	2.15	......
Clay Centre, Kans	1.11	1.19	0.38	5.96	4.74	3.34	6.06	1.45	([1])	([1])	([1])	([1])	......
Cleburne, Tex	4.48	1.01	2.82	6.41	9.02	5.83	1.32	0.51	2.51	0.47	1.38	1.56	37.32
Cleveland, Ohio	3.17	1.46	1.20	2.69	5.36	7.20	4.18	4.90	1.97	3.85	5.25	1.59	42.82
Clyde, Ohio	([1])	([1])	([1])	([1])	2.55	4.96	5.48	6.22	1.37	2.68	([1])	5.04	......
Cockburn Harbor, N. S	0.40	0.81	0.67	0.25	0.80	0.61	0.97	([1])	([1])	([1])	1.97	5.30	......
College City, Cal	1.60	0.47	0.56	0.76	([2])	0.23	0.00	([2])	0.05	0.96	8.85	3.55	17.07
College Hill, Ohio	6.31	1.80	0.20	4.50	2.25	4.10	2.60	4.10	3.25	4.00	2.75	1.60	37.46
Collinsville, Ill	3.06	0.76	0.45	4.32	2.56	7.42	2.37	2.93	6.78	5.52	2.54	1.55	40.26
Comfort, Tex	([1])	0.12	1.28	8.34	6.14	0.05	5.20	2.27	3.62	0.73	0.44	1.04	......
Conception, Mo	0.52	([1])	0.10	4.93	1.90	9.25	1.75	1.85	2.47	4.83	0.60	1.80	......
Contoocook, N. H	5.30	3.80	0.82	3.05	2.95	2.50	([1])	6.85	2.65	4.15	5.40	3.90	......

[1] No record. [2] Inappreciable.

Monthly and annual precipitation, from reports made by voluntary observers of the Signal Service, United States Army, &c.—Continued.

Stations.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
	In.	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*
Cooperstown, N. Y	3.00	2.46	0.55	1.94	3.39	3.59	3.00	9.08	1.96	4.19	3.05	2.15	38.36
Cornish, Me	4.00	4.50	2.00	2.93	2.94	5.23	6.64	6.08	2.00	3.85	5.93	3.30	49.40
Cresco, Iowa	1.21	0.43	0.75	1.66	1.16	3.99	5.04	4.45	4.22	1.14	0.39	1.49	25.93
Crete, Nebr	0.08	0.48	0.17	4.08	4.32	2.54	7.25	2.70	2.09	1.07	0.72	0.71	26.21
Cumberland, Md	3.80	2.52	1.30	1.79	3.77	0.86	1.01	3.87	0.75	4.14	1.73	1.55	27.09
Dale Enterprise, Va	4.47	2.94	1.72	2.85	5.37	4.14	2.86	3.09	1.04	12.60	4.05	2.53	47.16
Deerfield, Mass	([1])	([1])	([1])	3.40	2.70	3.62	2.25	([1])	1.28	6.84	6.09	3.07	......
De Soto, Nebr	0.65	0.73	0.28	3.52	3.70	4.26	3.55	4.02	1.57	2.01	1.84	1.73	27.36
Distributing Reservoir, D. C	3.81	4.52	1.25	1.74	2.79	3.64	1.45	7.81	3.01	9.57	3.47	1.61	44.17
Dorset, Vt	6.26	3.37	1.44	2.08	3.09	3.76	4.35	5.66	5.67	2.52	3.69	3.03	44.92
Dover, N. J	4.25	0.04	1.45	1.02	3.00	1.00	4.95	7.00	0.95	5.85	7.90	4.10	41.51
Drifton, Pa	5.25	3.39	0.76	1.99	2.30	2.00	([1])	7.44	1.39	5.66	5.46	2.82	......
Dudley, Mass	3.86	4.15	([1])	1.90	3.15	2.02	1.26	5.90	1.75	3.74	4.12	2.72	......
Dyberry, Pa	4.52	2.75	1.03	2.48	2.35	3.92	1.70	8.77	1.04	3.52	4.41	2.23	38.72
Easton, Pa	4.74	4.18	0.77	2.40	2.20	2.74	2.63	7.76	0.59	5.37	4.03	3.80	40.80
East Portland, Oreg	3.16	6.08	([2])	1.08	([1])	3.11	0.04	0.00	1.13	1.15	4.01	4.13	......
Elk Falls, Kans	([1])	([1])	1.00	19.00	6.50	5.75	([1])	([1])	10.75	2.00	1.75	1.00	......
Embarras, Wis	2.35	0.80	1.40	2.65	5.35	3.65	10.45	5.15	2.05	2.40	2.65	3.75	42.65
Emmittsburg, Md	4.78	3.74	1.94	2.80	3.69	2.40	2.10	([1])	0.88	7.72	3.80	3.44	......
Emporia, Kans	1.20	0.46	0.74	5.70	4.18	3.85	10.26	2.12	5.38	1.28	0.95	0.70	36.82
Eola, Oreg	4.16	7.06	0.55	1.39	3.23	1.40	([1])	0.00	2.67	1.42	7.36	7.41	......
Factoryville, N. Y	2.14	1.37	0.33	1.51	3.91	3.90	2.99	3.94	1.87	5.60	2.24	1.26	31.06
Fairbury, Nebr	([1])	([1])	([1])	5.33	3.28	1.37	7.56	1.04	2.91	1.81	([1])	1.17	......
Fall Brook, Cal	0.92	0.13	0.29	2.60	0.29	0.11	0.00	0.02	0.00	0.00	5.92	1.13	11.41
Fall River, Mass	5.11	2.80	1.20	2.70	4.30	2.65	1.35	5.17	1.33	4.45	3.10	3.56	37.72
Fallsington, Pa	4.03	4.91	1.19	2.30	1.51	1.02	4.05	7.56	1.07	4.23	3.58	3.26	38.71
Fallston, Md	4.65	4.50	1.44	1.60	5.28	4.01	3.33	10.75	0.64	7.07	4.68	2.64	50.68
Forsyth, Ga	7.94	2.92	3.79	1.05	6.47	4.61	4.04	5.38	8.67	4.10	3.26	3.07	55.90
Fort Madison, Iowa	2.20	([1])	0.00	3.27	1.53	4.93	2.40	3.50	4.13	3.15	0.53	1.80	......
Fort Scott, Kans	([1])	1.50	1.75	3.73	2.48	3.82	([1])	([1])	3.55	1.65	0.50	([1])	......
Fort Wayne, Ind	0.40	([1])	0.50	4.11	7.09	4.14	2.76	4.77	3.15	4.90	4.25	2.66	......
Frankfort, Ky	6.42	2.91	1.31	4.87	5.07	2.97	1.61	1.88	3.64	4.78	3.38	2.69	41.53
Franklin, Pa	4.88	2.08	1.70	2.18	3.70	6.75	2.50	6.22	3.09	4.50	3.33	2.58	43.[illegible]
Franklin, Wis	3.20	([1])	([1])	([1])	0.47	5.34	7.61	6.06	4.25	([1])	([1])	([1])	......
Fremont, Nebr	0.50	0.92	0.33	5.55	4.30	3.23	3.36	5.11	1.08	3.81	1.38	1.07	30.64
Gallinas Spring, N. Mex	([1])	([1])	1.00	0.95	1.77	1.68	1.65	2.51	([2])	0.35	0.25	1.00	......
Gardiner, Me	5.26	6.44	2.18	2.50	3.41	5.06	1.73	3.21	1.98	3.94	2.86	4.00	42.57
Garrettsville, Ohio	3.22	1.58	1.37	2.70	3.66	6.05	5.55	7.44	2.31	4.29	3.14	1.78	43.04
Genoa, Nebr	1.00	0.57	0.34	5.32	2.17	2.48	1.39	4.09	2.29	1.60	1.82	0.65	23.22
Germantown, Pa	4.85	4.63	1.20	2.80	3.65	0.92	([1])	8.80	0.83	5.58	3.86	3.33	......
Grampian Hills, Pa	3.82	2.23	1.34	3.63	4.06	2.96	6.14	8.03	1.14	2.92	3.73	2.72	42.72
Grand Coteau, La	6.91	1.62	5.37	4.44	6.12	5.54	5.21	7.57	10.58	0.56	4.0[illegible]	2.70	60.64
Grand Turk Island, W. I	0.70	0.28	0.65	0.75	0.65	0.30	2.68	([1])	([1])	([1])	2.08	5.48	......
Great Falls Reservoir, Md	3.23	4.15	1.28	1.12	1.99	2.62	0.29	6.03	2.68	8.23	3.80	2.16	37.08
Greensborough, Ala	8.94	3.33	2.92	3.17	5.88	4.00	2.51	([1])	1.84	1.37	7.32	5.83	......
Green Springs, Ala	7.04	2.72	2.61	2.69	7.35	3.16	2.95	2.23	([1])	([1])	([1])	([1])	......
Guilford, Ind	([1])	2.76	0.37	3.94	2.09	4.44	3.25	5.46	3.50	2.58	2.55	1.75	......
Guttenberg, Iowa	1.23	0.58	0.41	2.27	1.56	4.50	6.08	4.76	4.81	1.41	([1])	2.26	......
Hartford, Conn	4.62	3.45	0.93	3.08	3.42	2.79	4.96	8.84	2.26	4.48	5.02	3.89	47.74
Harvard, Nebr	([1])	([1])	([1])	3.00	5.25	([1])	([1])	([1])	1.50	4.00	1.50	1.75	......
Haverford College, Pa	3.78	5.80	0.78	3.82	5.82	1.61	([1])	([1])	([1])	([1])	([1])	([1])	......
Helvetia, W. Va	5.90	2.65	2.54	5.04	3.50	4.66	4.41	3.14	1.42	5.80	4.06	3.19	46.31
Hiram, Ohio	3.01	1.70	1.30	3.01	3.92	7.66	5.37	6.66	2.81	5.19	3.73	2.02	46.38
Hudson, Mich	1.07	1.09	0.25	2.30	4.72	2.82	4.06	4.54	([1])	4.66	3.28	1.62	......
Humboldt, Iowa	1.62	1.04	0.12	([1])	([1])	([1])	([1])	([1])	([1])	([1])	0.65	0.96	......
Humphrey, N. Y	2.51	1.57	1.39	2.86	4.99	5.96	2.38	10.11	4.44	4.17	2.71	3.31	46.40
Huntsville, Tex	([1])	3.01	4.51	7.45	8.29	2.02	2.59	1.86	5.35	1.46	2.26	3.88	......
Hydesville, Cal	4.61	3.43	0.24	1.76	([1])	1.00	([1])	([1])	([1])	1.12	18.37	9.31	......
Independence, Iowa	1.62	0.86	0.53	2.30	3.83	5.78	4.99	7.10	3.75	1.62	0.26	1.80	34.44
Independence, Kans	2.12	1.22	1.81	5.12	5.62	5.27	5.02	7.46	7.94	1.79	0.58	0.95	44.40
Independence, Mo	0.75	0.75	0.40	7.65	1.95	7.19	6.45	9.36	8.63	2.84	([1])	([1])	......
Indianola, Iowa	1.42	0.74	([2])	3.97	1.89	([1])	.....	7.98	2.91	3.35	([1])	([1])	......
Ithaca, N. Y	2.09	1.59	0.49	1.73	2.51	3.69	2.84	8.14	2.36	5.26	2.77	1.63	35.10
Jacksonborough, Ohio	4.05	2.95	1.22	3.17	2.62	3.25	3.65	5.85	4.50	2.00	2.35	1.90	37.01
Jeffersonville, Ind	5.35	2.41	1.13	4.29	3.87	2.68	2.44	2.08	5.31	4.28	3.65	2.43	39.92
Kalamazoo, Mich	4.58	2.84	1.07	2.20	1.44	3.48	2.28	8.94	3.56	([1])	3.11	2.63	......
Kenewick, Wash	0.51	0.49	0.04	([2])	1.38	0.93	([2])	([1])	0.41	0.26	0.99	1.03	......
Kew, W. I	1.25	1.03	0.37	2.50	8.25	1.10	7.50	([1])	([1])	([1])	6.72	5.08	......
Laconia, Ind	5.90	2.24	0.77	2.93	4.25	3.23	1.33	4.30	5.36	4.50	3.64	2.24	40.69
Lafayette, Ind	3.30	2.02	0.46	3.72	3.51	3.67	4.67	4.93	4.64	2.96	2.33	2.54	38.75
La Grange, Ind	3.96	1.43	0.83	([1])	4.18	([1])	([1])	4.75	([1])	([1])	3.20	3.60	......
Lake Village, N. H	4.71	4.37	1.45	2.58	1.94	2.92	3.72	7.97	1.45	2.49	5.86	4.49	43.95
Lansing, Mich	1.59	0.45	0.60	2.38	1.85	5.88	2.04	6.75	3.46	3.60	3.05	2.86	34.51
Lawrence, Kans	1.66	1.12	0.87	([1])	([1])	2.89	6.03	([1])	([1])	3.32	([1])	1.25	......
Lead Hill, Ark	2.65	1.47	3.60	5.38	3.73	3.69	3.31	4.14	3.64	1.22	2.50	2.30	2.63

[1] No record.
[2] Inappreciable.

Monthly and annual precipitation, from reports made by voluntary observers of the Signal Service, United States Army, &c.—Continued.

Stations.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
	In.	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*
Leicester, Mass	4.00	3.38	1.02	2.85	3.00	2.26	([1])	7.71	1.50	4.91	([1])	3.96	......
Lenoir, N. C	4.90	3.30	1.30	1.30	10.10	3.80	6.70	3.20	3.30	9.50	5.20	[illegible]	[illegible]
Le Roy, N. Y	2.53	1.49	0.83	3.20	2.78	5.08	2.70	4.85	3.54	2.80	2.30	3.23	56.42
Liberty Hill, La	([1])	([1])	([1])	3.77	2.90	5.84	4.41	2.79	7.66	1.80	2.31	2.47	......
Limona, Fla	3.80	4.45	1.46	0.20	2.82	3.93	9.30	1.85	10.64	1.95	0.52	1.[illegible]	42.75
Lincolnton, N. C	2.58	4.68	3.30	1.45	8.79	1.44	3.77	3.68	4.10	5.44	6.20	3.43	48.95
Logan, Iowa	([1])	1.10	0.30	4.90	6.00	9.80	5.10	5.40	1.00	4.30	1.40	1.40	......
Logansport, Ind	2.01	4.10	2.15	3.74	5.02	5.23	4.00	2.72	5.00	3.68	2.92	3.06	43.62
Luling, La	7.83	2.04	5.79	5.31	5.02	2.80	5.04	8.39	9.44	0.00	4.95	4.42	61.[illegible]
Lunenburg, Vt	0.70	2.35	2.25	0.20	1.00	3.88	([1])	5.77	2.90	4.41	2.55	1.70	......
Madison, Nebr	3.50	1.15	0.59	3.75	6.81	0.88	([1])	6.25	([1])	([1])	0.75	0.37	......
Madison, Wis	2.44	0.82	0.02	3.45	1.08	([1])	7.30	6.41	4.05	2.37	([1])	3.20	......
Mahanoy Plane, Pa	([1])	([1])	0.39	2.28	3.42	1.04	1.75	9.99	0.76	5.54	6.78	4.17	......
Manatee, Fla	4.34	6.13	4.20	1.00	8.90	7.51	12.54	5.27	13.68	1.26	0.22	2.21	67.26
Manchester, Iowa	1.37	0.54	0.33	3.57	3.08	4.47	5.03	7.71	4.98	1.48	0.29	2.51	45.31
Manhattan, Kans	([1])	0.50	0.35	4.95	4.21	2.15	4.33	0.89	4.03	([1])	0.80	0.57	......
Manistique, Mich	2.05	2.16	3.28	2.19	2.28	2.23	1.02	5.32	0.94	2.53	3.70	3.[illegible]	[illegible]
Manitowoc, Wis	1.98	0.71	0.65	1.98	1.25	3.09	5.57	4.62	3.67	3.17	1.87	3.24	31.60
Marietta, Cal	([1])	([1])	([1])	([1])	([1])	([1])	0.00	0.70	0.00	0.00	5.15	0.74	......
Marion, Va	4.29	2.36	2.20	3.00	5.91	3.79	4.47	2.57	0.95	4.28	2.18	2.00	38.60
Marquette, Nebr	2.30	0.58	0.06	5.43	2.45	4.79	4.75	3.79	2.06	2.86	0.81	0.69	30.58
Mattoon, Ill	2.47	0.65	0.58	6.20	6.38	6.70	3.80	7.80	5.30	4.60	2.20	3.00	48.68
Maud, Kans	0.28	0.38	1.03	7.50	4.69	1.80	3.17	([1])	([1])	([1])	([1])	([1])	......
Mauzy, Ind	3.69	1.09	0.83	4.25	2.00	5.76	1.59	4.75	2.47	2.89	2.35	2.02	34.56
Mayport, Fla	5.86	4.48	3.62	0.87	8.53	6.51	5.07	7.59	24.43	5.38	([1])	([1])	......
Mazatlan, Mex	3.50	0.04	([2])	([2])	([1])	0.98	3.03	20.09	10.56	5.81	([1])	([2])	......
McDonogh, Md	2.96	3.62	1.25	0.89	3.38	4.88	3.95	5.05	0.80	6.38	4.02	1.36	38.54
Menand Station, N. Y	3.80	2.04	0.84	3.03	2.11	2.83	2.53	8.19	1.74	5.38	3.84	1.48	37.30
Merritt's Island, Fla	([1])	([1])	([1])	([1])	([1])	0.27	2.71	10.28	11.15	4.61	0.42	1.27	......
Milan, Tenn	7.50	2.57	1.04	3.27	2.72	5.51	3.71	0.72	3.66	2.89	3.06	2.91	40.46
Milledgeville, Ga	8.37	3.39	3.32	0.98	6.69	4.06	3.04	7.70	9.38	4.80	([1])	2.66	......
Milton, Mass	5.83	2.46	1.40	3.17	4.29	3.11	1.53	5.89	1.57	([1])	6.10	2.00	......
Minneapolis, Minn	0.39	0.33	0.64	2.87	2.08	3.34	4.52	3.59	5.27	1.76	1.00	0.89	26.68
Monticello, Iowa	1.75	0.72	0.22	4.16	3.60	5.44	6.16	8.54	3.95	2.65	0.61	2.48	40.23
Moorestown, Mich	2.42	1.54	1.39	2.50	2.26	([1])	([1])	([1])	([1])	([1])	([1])	([1])	......
Moorestown, N. J	3.43	4.23	1.08	2.82	([1])	2.57	3.08	([1])	([1])	3.48	3.77	3.07	......
Mottville, Mich	5.06	3.01	([1])	3.63	3.12	4.71	2.25	3.06	3.75	5.50	2.28	3.00	..
Mountainville, N. Y	4.89	3.56	0.76	2.30	2.42	1.22	2.58	7.86	0.82	6.09	6.22	2.59	40.61
Mount Forest, Canada	2.61	([1])	([1])	0.00	([1])	([1])	([1])	([1])	([1])	([1])	4.14	([1])	......
Mount Ida, Ark	([1])	4.10	2.20	8.60	5.35	7.30	6.40	1.90	2.25	0.30	3.60	3.20	
Muscatine, Iowa	2.38	2.21	0.25	4.17	4.18	4.81	5.02	7.88	7.68	2.80	0.83	2.32	44.23
Nayatt Point, R. I	5.55	5.10	0.83	1.65	5.92	4.45	([1])	([1])	([1])	([1])	([1])	([1])	.
Neillsville, Wis	0.62	0.12	0.50	1.72	1.80	1.30	5.65	0.40	4.20	0.50	0.30	1.35	18.46
Nephi, Utah	0.52	2.17	0.45	4.19	2.09	1.67	0.02	2.65	([1])	([1])	([1])	([1])	....
New Bedford, Mass	3.79	3.21	1.30	2.69	3.25	4.16	1.15	4.14	1.86	4.06	3.07	3.22	35.09
Newport, Vt	4.39	3.34	2.42	3.47	3.16	4.48	6.62	3.91	4.26	6.41	3.97	2.[illegible]	49.31
New Ulm, Tex	([1])	([1])	2.14	5.71	8.01	0.51	3.24	0.09	3.51	1.93	0.89	3.79	.
North Colebrook, Conn	3.[illegible]	2.13	2.70	5.18	2.22	1.42	2.07	5.78	0.15	3.97	3.46	4.49	36.[illegible]
Northfield, Minn	0.57	0.29	0.81	3.24	2.36	3.90	5.67	4.16	4.49	2.04	0.55	0.09	28.77
North Lewisburg, Ohio	4.60	1.80	0.80	3.90	5.00	3.70	2.45	7.55	3.15	2.20	2.45	1.35	39.15
Northport, Mich	1.95	0.41	0.30	1.30	([1])	([1])	([1])	([1])	([1])	([1])	([1])	([1])	.
North Volney, N. Y	3.15	2.20	0.90	2.40	2.70	3.05	4.35	2.20	3.30	3.70	2.05	3.65	34.55
Oakland, Cal	1.92	0.48	1.07	3.12	0.10	0.08	0.02	0.00	0.05	0.30	11.11	4.33	22.58
Orono, Me	4.73	4.45	2.78	2.34	3.88	4.00	4.70	7.36	2.52	5.12	5.37	5.64	52.99
Oroville, Cal	([1])	([1])	0.25	1.64	([1])	0.39	([2])	0.00	0.20	([2])	11.27	5.53	......
Oskaloosa, Iowa	([1])	1.48	([1])	([1])	([1])	([1])	([1])	7.09	3.39	2.05	0.81	1.69	......
Ottumwa, Iowa	1.33	1.90	0.03	4.42	1.15	5.44	4.36	4.48	2.68	([1])	([1])	([1])	......
Pacolet, S. C	([1])	([1])	2.75	1.93	6.14	3.44	1.22	2.09	2.92	7.50	3.22	3.06	......
Palermo, N. Y	3.41	2.55	0.68	1.00	2.29	2.92	3.85	2.98	3.99	3.13	2.50	3.98	33.23
Paramaribo (Dutch Guiana), S. A	7.27	5.09	2.13	5.19	11.52	13.65	11.17	3.01	4.70	1.33	1.28	10.70	77.04
Paterson, N. J	3.47	4.09	([1])	1.04	([1])	1.89	([1])	6.48	([1])	([1])	([1])	3.28	
Penn Yan, N. Y	2.14	1.61	0.40	1.72	2.07	7.54	2.86	4.27	2.05	2.59	1.60	1.35	30.29
Peoria, Ill	2.63	0.87	0.24	4.44	1.70	4.07	4.73	2.64	5.28	2.32	1.04	2.41	32.40
Phillipsburg, N. J	3.74	4.00	0.78	([1])	2.23	2.19	2.51	7.35	([1])	1.55	([1])	2.40	
Pierce City, Mo	1.20	0.90	1.90	0.80	5.50	5.10	8.70	7.20	6.90	1.40	2.49	1.00	48.00
Pleasant Grove, Wash	0.90	0.44	([1])	0.03	1.18	0.57	0.01	([2])	0.39	0.06	1.60	1.55	......
Point Pleasant, La	4.30	4.72	5.16	19.58	2.97	3.86	4.03	5.36	9.78	1.22	6.97	3.27	71.82
Portsmouth, Ohio	6.41	2.41	1.02	4.04	3.72	2.39	2.12	5.52	2.40	3.69	1.71	1.83	37.28
Poway, Cal	0.72	0.35	0.34	2.05	0.63	0.07	0.00	([2])	0.00	0.06	2.71	0.90	7.83
Prairie du Chien, Wis	1.01	1.00	0.16	2.46	1.45	2.53	6.37	5.82	4.53	1.72	0.80	2.95	30.80
Princeton, Cal	1.60	0.57	([1])	0.98	0.36	0.57	0.00	0.00	0.12	([1])	([1])	4.78	......
Princeton, Mass	8.75	2.94	1.41	2.93	3.03	1.67	4.23	6.89	1.40	4.08	6.09	1.91	46.51
Princeton, N. J	([1])	([1])	1.31	1.57	1.86	3.37	2.81	5.49	1.08	3.20	2.72	2.54	......
Providence, R. I	5.26	3.18	1.02	2.67	3.49	2.23	([1])	([1])	([1])	([1])	([1])	([1])	......

[1] No record. [2] Inappreciable.

Monthly and annual precipitation, from reports made by voluntary observers of the Signal Service, United States Army, &c.—Continued.

Stations.	January.	February.											
	In.	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*
Pueblo, Colo	(1)	0. 60	0. 40	1. 70	1 [illegible]	1 27	2. [illegible]	4. [illegible]	0. 02	0. 57	(2)	0. 78	......
Puerto de Luna, N. Mex	0. 9[illegible]	2. 10	0. 74	0. [illegible]	2. 60	2. 10	0. 65	2. 81	1 42	0. 33	0. 14	0. 0[illegible]	2[illegible]. 70
Quakertown, Pa	4. [illegible]	4. 20	1 21	2. 70	2. 32	0. 81	1 70	2. 34	(1)	4. [illegible]	4 [illegible]	2. 18	......
Raleigh, N C	4. [illegible]	(1)	(1)	1 70	6. 40	1 10	2. 00	0. 40	(1)	2. [illegible]	1 10	3. [illegible]	......
Readington, N. J	(1)	(1)	(1)	(1)	(1)	(1)	(1)	4. [illegible]	0. 72	5. [illegible]	3. [illegible]	2. [illegible]	......
Receiving Reservoir, D. C	4. 00	4. 16	1 27	1 27	2. 26	4. [illegible]	1 77	5. [illegible]	1. [illegible]	10. [illegible]	3 47	2. 0[illegible]	44. 43
Richardton, Dak	1. 90	0. 70	1 00	2. [illegible]	2. [illegible]	2. [illegible]	(1)	2. [illegible]	0. 10	1 [illegible]	1. 20	0. [illegible]	......
Richmond, Ky	6. 56	2. 21	1 04	4. 04	2. 00	2. 42	(1)	1. [illegible]	2. 22	4. [illegible]	2. 00	2. 5[illegible]	......
Riley, Ill	2. [illegible]	1. 05	0. 20	3. 07	1. 72	0. [illegible]	2. 07	6. [illegible]	2. [illegible]	2. 57	2. 0[illegible]	2. 37	3[illegible]. 70
Rockford, Ill	2. [illegible]	2. [illegible]	0. 70	4. [illegible]	2. [illegible]	0. 47	4. 10	9. 1[illegible]	4. 06	3. [illegible]	1 0[illegible]	2. 37	45. 16
Round Grove, Iowa	0. 30	(1)	(1)	(1)	0. 50	(1)	0 30	(1)	(1)	(1)	(1)	(1)	......
Rowe, Mass	4. 50	3. 01	1 [illegible]	3. 12	2. 0[illegible]	2. [illegible]	4. 16	7 37	1. 80	4. [illegible]	5. 5[illegible]	(1)	......
Rugg'es, Ohio	3. 00	0. [illegible]	0. 77	3. 15	4. [illegible]	5. 10	3. 06	0. 3[illegible]	2. 10	(1)	3. [illegible]	1. 2[illegible]	......
Sacramento, Cal	1. 96	0. 4[illegible]	0. [illegible]	4. [illegible]	(1)	0. 10	(2)	0. [illegible]	0. [illegible]	(2)	0. [illegible]	5. 3[illegible]	......
Salem, N J	(1)	(1)	1 00	2. [illegible]	2. 0[illegible]	2. 00	1 4[illegible]	10. [illegible]	(1)	(1)	(1)	(1)	......
Salina, Kans	1. [illegible]	0. 07	0. 00	7 [illegible]	4. 0[illegible]	3. [illegible]	7 02	3. 0[illegible]	2. 07	0. 64	0. 0[illegible]	0. 0[illegible]	27 [illegible]
Salinas City, Cal	1. 0[illegible]	0. 06	0. 16	1 21	0. 12	0. 00	0. 05	0. 00	0. 02	0. 0[illegible]	3. 0[illegible]	1 20	10. 71
Salt Cay, B. W. I	1. 00	0. 2[illegible]	0. 40	0. 07	0. 2[illegible]	0. 32	2. 2[illegible]	(1)	(1)	(1)	1. 5[illegible]	0. 0[illegible]	......
Sandwich, Ill	2. 0[illegible]	1 25	0. 6[illegible]	2. 0[illegible]	1. 3[illegible]	2. 06	2. 6[illegible]	6. [illegible]	3. [illegible]	2. 16	1 [illegible]	2. 17	31. 72
San Rafael, Cal	2. 37	0. 00	1 03	2. 24	0. 01	0. 08	0. 0[illegible]	(1)	0. 00	0. 70	15. 26	0. 0[illegible]	......
Sherlock, Kans	0. 0[illegible]	0. 04	0. [illegible]	2. 74	2. 31	4. 0[illegible]	4. 71	(1)	(1)	1 4[illegible]	0. 42	1. 12	......
Snowville, Va	2. 10	(1)	(1)	1. 00	2. [illegible]	1. 00	(1)	1. 0[illegible]	(1)	0. 20	(1)	(1)	......
Somerset, Mass	5. [illegible]	2. 77	1 14	2. 31	4. [illegible]	2. 41	2. 57	4. 1[illegible]	1. 15	4. 2[illegible]	3. [illegible]	3. 0[illegible]	[illegible]. 73
Somerville, N J	3. 0[illegible]	4. 67	0. [illegible]	1. 2[illegible]	2. [illegible]	2. [illegible]	7 [illegible]	4. 0[illegible]	0. [illegible]	4. 6[illegible]	3. [illegible]	2. 67	37. 73
South Bethlehem, Pa	3. 71	0. 2[illegible]	2. 06	2. 70	2. 34	0. 97	3. 4[illegible]	6. 6[illegible]	0. [illegible]	6. 64	3. 0[illegible]	(1)	......
South Evanston, Ill	(1)	2 6[illegible]	0. 0[illegible]	2. 2[illegible]	2 4[illegible]	4. 0[illegible]	2. 57	(1)	4. 06	2. 31	1 07	2. 2[illegible]	......
Southington, Conn	4. 3[illegible]	4. 6[illegible]	0. 07	1 0[illegible]	1 [illegible]	2. 05	2. 3[illegible]	(1)	0. [illegible]	5. 5[illegible]	5. 0[illegible]	3. 4[illegible]	......
South Orange, N. J.	3. 0[illegible]	4. 78	0. 01	1. 00	1 10	1 00	4. 0[illegible]	7 [illegible]	0. 2[illegible]	4. 2[illegible]	4. 10	3. 50	[illegible]
Spiceland, Ind	4. 00	1 53	0 72	4 30	5. 72	5 04	1 0[illegible]	5. 2[illegible]	2. 0[illegible]	1. 00	1 [illegible]	2. [illegible]	[illegible]. 37
Springfield, Mo	2. 0[illegible]	1 05	2. 10	5. 01	3. 2[illegible]	(1)	0. 14	5. 72	4. 12	1 75	2. 0[illegible]	1 [illegible]	..
Statesburg, S C	0. 04	3. 27	1 04	1 20	4 34	2. 2[illegible]	5. 67	2. 70	3. 4[illegible]	2. 62	3 4[illegible]	3. 4[illegible]	[illegible]
Statesville, N C	5. 0[illegible]	4 57	2. 12	1 47	6. 0[illegible]	2. 53	4. 67	2. 77	2. 2[illegible]	7 43	4. [illegible]	3. 0[illegible]	4[illegible]. 01
Sterling, Kans	1 40	0. 1[illegible]	0. 2[illegible]	10. 10	4 47	2. [illegible]	0. 0[illegible]	2. 02	3. 0[illegible]	0 57	0. [illegible]	1. 12	3[illegible]. 73
Stockham, Nebr	0 0[illegible]	5. 40	0. 45	4. 10	3. 20	3. 0[illegible]	4. [illegible]	7 73	1 [illegible]	(1)	1 0[illegible]	1. 8[illegible]	......
Strafford, Vt	4. 40	2 00	1 00	1 00	2. 0[illegible]	1 00	4. [illegible]	7 00	2. [illegible]	3. 00	4. 3[illegible]	3. 00	43. 10
Sumner, Ind	3. 0[illegible]	2. 85	0. 2[illegible]	4. 06	4 0[illegible]	4. 50	1 2[illegible]	7 4[illegible]	3. 0[illegible]	2. 07	3. 12	2. 22	4[illegible]. 02
Sussex, Wis	1 0[illegible]	1 17	1 07	2 51	0. [illegible]	3. 2[illegible]	5. 30	(1)	(1)	(1)	(1)	(1)	......
Swanwick, Ill	2. 61	0. 6[illegible]	0 2[illegible]	2. 01	4. 2[illegible]	5. 50	(1)	3. 10	(1)	(1)	(1)	(1)	......
Swartz Creek, Mich	2. 0[illegible]	1 41	0 [illegible]	2 00	2 [illegible]	5. 10	2. 0[illegible]	(1)	3. [illegible]	4. 0[illegible]	3. 10	3. 4[illegible]	..
Sycamore, Ill	7. 0[illegible]	1 56	0. 5[illegible]	4. 31	1 0[illegible]	7 06	4. 0[illegible]	0. 00	4. 10	4. 0[illegible]	3. 0[illegible]	3. 0[illegible]	4[illegible]. 50
Tacoma, Wash	5. 3[illegible]	4. 10	1 01	0. 47	2. [illegible]	0 40	0. 2[illegible]	0. 00	2. 44	2. 47	8 2[illegible]	8. 12	3[illegible]. 74
Tallahassee, Fla	(1)	(1)	(1)	3. 10	4. 10	(1)	0. 0[illegible]	9. 07	5. 1[illegible]	1 0[illegible]	2. 0[illegible]	1 0[illegible]	..
Taunton, Mass	5. 0[illegible]	2. 0[illegible]	1 07	2. 01	2. [illegible]	5. 21	2. [illegible]	4. 10	4. 94	3. [illegible]	2. [illegible]	3. 0[illegible]	4[illegible]. 47
Tecumseh, Nebr	1 1[illegible]	1. 2[illegible]	0. 2[illegible]	4. 00	4. [illegible]	5. 70	0. 12	1 0[illegible]	2. 0[illegible]	3. 2[illegible]	0. [illegible]	0. 00	[illegible]. 00
Terre Haute, Ind	1 21	1 00	(1)	4 01	(1)	(1)	3. [illegible]	(1)	9 [illegible]	4. 10	3. 20	4 00	...
Thornville, Mich	2. 0[illegible]	1 53	1. 16	2 01	3. 12	5. [illegible]	3. 10	5. 15	2. 44	2. [illegible]	4 [illegible]	3. 00	37 2[illegible]
Tiffin, Ohio	2. 21	1 00	0. [illegible]	3. 07	4. 2[illegible]	4. [illegible]	3. 21	0. 2[illegible]	1 7[illegible]	2. 31	2. [illegible]	1 [illegible]	2[illegible]. 40
Topeka, Kans	1 54	0. 57	1 0[illegible]	5. 20	4. 2[illegible]	2. 37	(1)	4 [illegible]	4. 5[illegible]	2. 4[illegible]	0 [illegible]	0. [illegible]	...
Traverse City, Mich	4. 07	1 75	2. [illegible]	3. 12	3. 0[illegible]	1 [illegible]	2. [illegible]	4. 0[illegible]	2. 21	2. [illegible]	2. [illegible]	4 [illegible]	3[illegible]. [illegible]
Troy, Pa	2. 77	1 [illegible]	0. 0[illegible]	1 5[illegible]	1. 07	1. 57	1 0[illegible]	3. 01	1 4[illegible]	5. 74	2 07	1. 2[illegible]	3[illegible]. 77
Tucson, Ariz	0. 0[illegible]	0 42	0. 4[illegible]	(1)	(2)	0. 12	1 00	1 70	0. 12	0. 00	0 44	1. 01	5. [illegible]
Variety Mills, Va	4. 43	3. 01	1. 72	1 [illegible]	7 [illegible]	(1)	(1)	(1)	(1)	10. 70	2 [illegible]	2. 8[illegible]	......
Vermillion, Dak	0. 54	0. 2[illegible]	(2)	1 [illegible]	1. 17	3. 2[illegible]	2. 33	2. 07	2 07	0. [illegible]	1 54	0. 5[illegible]	18. 10
Vevay, Ind	5. 4[illegible]	7 4[illegible]	1 [illegible]	4. 0[illegible]	2. 47	3. 0[illegible]	2. 4[illegible]	3. [illegible]	3. 0[illegible]	7 0[illegible]	2. 04	3. 02	37 11
Vineland, N. J	2. 07	2. 70	0. 81	2. 07	5. 4[illegible]	1. 21	1. 2[illegible]	5. 11	0. [illegible]	6. 0[illegible]	4. 01	1. 4[illegible]	[illegible]
Voluntown, Conn	4. 00	3. 20	1 00	2. 23	2. 0[illegible]	1 45	2. 3[illegible]	6. 0[illegible]	0. 0[illegible]	5. 2[illegible]	3. 10	2. 40	41. 22
Wabash, Ind	2. 0[illegible]	1. 20	0. 52	4. 07	4. 0[illegible]	5. 07	(1)	(1)	(1)	(1)	(1)	(1)	......
Washington City	2. 9[illegible]	2. 10	1. 40	1. 4[illegible]	2. 4[illegible]	2. [illegible]	(2)	(1)	2. 0[illegible]	0. 77	2. 0[illegible]	2. 4[illegible]	......
Washington, Pa	(1)	(1)	(1)	2. 45	2. 0[illegible]	(1)	(1)	(1)	(2)	4. 0[illegible]	4 0[illegible]	(1)	......
Waterville, Me	(1)	2. 0[illegible]	(1)	(1)	1 2[illegible]	(1)	(1)	(1)	(1)	(1)	(1)	(1)	......
Wausau, Wis	0. 84	0. 21	4. [illegible]	2. 10	2. 01	1 07	4. 61	2. 30	2. 0[illegible]	0. 0[illegible]	1 07	2. 4[illegible]	2[illegible]. 73
Wauseon, Ohio	3. 2[illegible]	1 16	0. 0[illegible]	3. 71	5. 01	2. 0[illegible]	2. 00	4. 2[illegible]	2. 14	2. 00	2. 73	2. 07	3[illegible]. 0[illegible]
Webster, Dak	0. 81	(2)	0. 71	0. 2[illegible]	3. 2[illegible]	0. [illegible]	4. 07	1 41	0. 20	0. 7[illegible]	1 17	0. 0[illegible]	[illegible]. 01
Weir's Bridge, N H	4. 47	2. 0[illegible]	1. 42	2. 40	2 0[illegible]	3. 0[illegible]	4. 15	7 42	1 4[illegible]	2. 37	4. [illegible]	6. 74	41. 77
Weldon, N C	4. 70	2. 4[illegible]	2. 2[illegible]	2. 01	5. 6[illegible]	2. 2[illegible]	3. 0[illegible]	1 3[illegible]	1 [illegible]	5. 11	2. 3[illegible]	3. 2[illegible]	41. [illegible]
Wellington, Kans	1. 2[illegible]	0. 57	2. 0[illegible]	4. 0[illegible]	7 10	3. 00	4. 0[illegible]	0. 01	5. 31	2. 41	1. 07	1 37	3[illegible]. [illegible]
Wellsborough, Pa	3. 81	1. 40	1 1[illegible]	2. 31	2. 16	2. 7[illegible]	3. 77	15. 2[illegible]	2. 0[illegible]	7 20	1. 0[illegible]	3. [illegible]	[illegible]
Wel'sburg, W Va	5. 0[illegible]	2. 00	3. [illegible]	2. 0[illegible]	4. 3[illegible]	3. 50	3. 0[illegible]	7 45	1 0[illegible]	4. 07	(1)	(1)	......
Westborough, Mass	4. 47	4. 3[illegible]	1 0[illegible]	3. 32	2. 0[illegible]	3. 2[illegible]	1 0[illegible]	7 1[illegible]	1 24	4. 4[illegible]	5. 14	2. 07	4[illegible]. 37
West Chester, Pa	4. 03	6. 20	1 24	2 20	4. 07	1 2[illegible]	0. 0[illegible]	(1)	1 4[illegible]	6. 2[illegible]	4. 71	4. 10	......
Westerville, Ohio	5. 40	1 0[illegible]	1 0[illegible]	2. 84	5. [illegible]	7 21	2. 5[illegible]	6. 0[illegible]	2. 71	2. 0[illegible]	2. 2[illegible]	1 2[illegible]	[illegible]. 07
West Leavenworth, Kans	0. 0[illegible]	(1)	1 2[illegible]	5. 0[illegible]	6. 0[illegible]	4. 70	4 00	3. 15	7 30	0. 5[illegible]	2. 20	0. 40	....
Westmoreland, Kans	(1)	(1)	(1)	7 01	5. 02	2 2[illegible]	(1)	2. 12	4. 0[illegible]	2 [illegible]	0. 3[illegible]	1 12	..
West Union, Iowa	2. 14	0. 8[illegible]	1 07	2. 2[illegible]	1 0[illegible]	2. 00	5. 2[illegible]	7. 3[illegible]	3. 0[illegible]	0. 0[illegible]	0. 3[illegible]	1 0[illegible]	3[illegible]. 02
White Plains, N. Y	4. 50	0. 56	2. [illegible]	6. 0[illegible]	2. 2[illegible]	1 10	5. 3[illegible]	8. 30	1. 2[illegible]	6. 45	2. 00	4. 00	[illegible]

(1) No record. (2) Inappreciable.

Monthly and annual precipitation, from reports made by voluntary observers of the Signal Service, United States Army, &c.—Continued.

Stations.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
	In.	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*
Wilkesbarre, Pa	5.18	3.27	0.90	2.56	2.66	2.51	3.01	7.92	1.20	4.65	5.15	2.68	41.69
Williamstown, Mass	6.63	3.56	0.96	3.18	2.00	1.38	2.87	6.66	1.65	3.12	3.97	3.43	39.41
Wilton Centre, Ill	3.62	2.76	0.63	3.37	1.61	1.45	4.70	7.79	3.34	(1)	(1)	(1)	......
Wolfborough, N. H	4.58	5.63	1.63	2.61	2.00	4.48	5.23	7.68	0.90	3.23	6.49	4.83	49.47
Woodstock, Md	3.62	3.81	0.79	1.81	2.54	2.73	3.98	6.43	1.52	10.23	4.03	3.02	44.91
Woodstock, N. H	5.82	3.20	2.35	1.88	1.68	5.43	5.07	12.92	2.60	4.25	5.05	5.05	54.80
Woodstock, Vt	4.42	2.85	1.55	1.98	2.04	2.28	3.29	8.48	2.35	4.70	4.53	(1)	......
Worcester, Mass	5.01	3.49	0.90	2.83	3.26	3.49	2.10	6.52	0.87	4.81	5.96	3.09	42.33
Wyandotte, Kans	1.31	0.83	0.48	6.00	2.70	7.03	4.77	7.86	6.83	4.12	1.52	0.80	44.25
Wysox, Pa	(1)	(1)	(1)	0.46	2.19	2.80	3.27	5.15	1.12	6.63	2.66	1.91	......
Wytheville, Va	3.83	1.94	1.49	2.19	7.04	1.40	1.32	3.70	1.66	4.60	2.56	3.02	34.84
Yates Centre, Kans	1.80	0.55	1.16	5.33	4.68	3.06	11.68	2.28	6.99	3.00	0.84	1.08	42.45
Yellow Springs, Ohio	(1)	(1)	0.58	3.92	4.26	3.05	3.16	6.47	2.76	2.62	2.86	1.59	......
Yutan, Nebr	0.40	0.57	0.17	3.49	5.66	2.32	2.90	(1)	(1)	2.36	1.02	1.49	......

[1] No record.

APPENDIX 43.

Monthly and annual precipitation at military post hospitals for the year ending December 31, 1885.

[1] No record. [2] Inappreciable.

APPENDIX 44.

Monthly and annual precipitation, at stations on the Central Pacific and Southern Pacific Railroads and connecting branches, for the year ending December 31, 1885.

[Copied from the records on file at the office of the chief engineer of the Central Pacific Railroad.]

Monthly and annual precipitation, at stations on the Central Pacific, &c.—Continued.

[1] Inappreciable. [2] No record. [3] Discontinued November 1, 1885.

APPENDIX 45.

Precipitation at the cotton-region stations of the Signal Service, United States Army, for the months May to October, 1885, both inclusive.

Districts and stations.	May.	June.	July.	August.	September.	October.
Wilmington, N. C.:	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*
Charlotte, S. C	5.53	3.48	6.31	3.18	3.45	6.64
Cheraw, S. C	6.48	4.98	4.98	2.69	1.90	6.23
Florence, S. C	4.71	5.64	3.99	7.22	3.37	4.39
Goldsborough, N. C	5.87	5.31	5.25	4.67	2.70	3.20
Lumberton, N. C	6.46	7.67	7.34	3.02	3.69	4.04
New-Berne, N. C	10.86	5.17	5.53	5.94	3.00	3.41
Raleigh, N. C	7.00	0.99	2.02	5.77	2.42	4.00
Salisbury, N. C	6.35	8.60	3.35	3.28	2.54	5.49
Wadesborough, N. C	3.97	1.73	2.61	1.82	1.93	3.21
Weldon, N. C	8.59	1.85	5.21	1.35	2.25	(1)
Wilmington, N. C	8.58	8.20	4.04	4.73	5.69	8.73
Charleston, S. C.:						
Branchville, S. C	1.03	5.47	3.00	7.24	2.36	3.18
Charleston, S. C	2.20	5.96	7.49	19.18	3.32	8.09
Hardeeville, S. C	4.73	12.95	7.83	17.01	5.89	6.10
Jacksonborough, S. C	3.08	5.95	8.68	10.71	2.63	4.29
Kingstree, S. C	5.86	5.64	5.74	10.19	(1)	(1)
Saint George's, S. C	3.73	4.85	4.47	6.33	2.58	3.79
Saint Matthew's, S. C	4.51	5.57	8.83	5.75	2.15	4.56
Yemassee, S. C	5.67	6.20	8.74	14.72	7.37	3.80
Augusta, Ga.:						
Allendale, S. C	5.77	4.12	6.49	4.58	5.24	3.85
Athens, Ga	6.95	4.01	5.01	7.61	8.06	5.07
Augusta, Ga	5.87	2.80	3.57	3.50	2.72	4.18
Batesburg, S. C	4.59	5.29	3.45	3.23	4.28	6.14
Blackville, S. C	2.64	7.20	4.46	5.85	3.92	3.90
Camak, Ga	6.04	5.22	2.63	3.48	7.35	5.27
Chester, S. C	1.71	2.46	5.23	3.84	2.55	5.50
Columbia, S. C	9.21	4.90	5.04	2.86	2.47	4.02
Greenwood, S. C	4.09	4.18	2.36	5.13	3.69	5.59
Union Point, Ga	3.65	2.47	3.30	4.29	6.43	6.32
Washington, Ga	8.43	4.33	1.18	3.54	5.27	4.90
Waynesborough, Ga	4.79	3.49	1.83	3.83	3.63	4.15
Savannah, Ga.:						
Albany, Ga	5.07	3.32	9.09	5.61	3.85	2.45
Allapaha, Ga	4.09	1.74	5.38	7.90	6.95	3.75
Bainbridge, Ga	0.44	0.31	0.73	0.95	2.45	0.11
Cedar Keys, Fla	3.48	10.96	9.17	10.09	5.76	4.38
Eastman, Ga	0.19	0.15	0.42	2.80	7.96	4.45
Fernandina, Fla	5.21	3.97	7.62	7.47	13.16	5.26
Fort Gaines, Ga	3.21	2.21	3.88	5.41	5.12	2.96
Jessup, Ga	3.48	8.00	7.41	11.68	12.52	10.02
Live Oak, Fla	5.58	6.97	5.51	9.71	11.18	3.35
Millen, Ga	3.12	4.86	5.56	6.87	3.98	3.39
Quitman, Ga	4.59	1.66	3.37	2.04	4.10	2.07
Savannah, Ga	3.98	8.10	7.30	14.95	11.96	7.69
Smithville, Ga	4.64	2.38	4.04	4.99	3.61	0.88
Thomasville, Ga	3.08	6.15	4.60	8.19	6.69	2.66
Waldo, Fla	6.30	1.89	1.23	3.15	4.52	0.14
Way Cross, Ga	5.15	4.35	7.55	8.89	16.13	3.60
Atlanta, Ga.:						
Anderson, S. C	2.35	3.74	3.45	4.48	5.12	5.32
Atlanta, Ga	6.21	4.83	4.02	6.92	6.50	3.95
Cartersville, Ga	6.08	3.61	3.42	5.62	4.37	4.03
Columbus, Ga	6.01	3.83	3.66	6.64	6.25	5.62
Dalton, Ga	7.25	6.16	1.58	3.70	8.74	8.93
Gainesville, Ga	4.04	2.81	5.06	5.05	6.73	4.58
Greenville, S. C	4.16	4.37	3.75	6.39	8.97	6.78
Griffin, Ga	6.88	3.09	5.68	5.81	11.64	4.86

[1] No record.

Precipitation at the cotton-region stations of the Signal Service, &c.—Continued.

Districts and stations.	May.	June.	July.	August.	September.	October.
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*
Atlanta, Ga.—Continued:						
Macon, Ga	5.18	3.35	0.46	3.03	8.05	3.78
Newnan, Ga	6.60	3.29	5.62	6.95	8.08	5.86
Spartanburg, S. C	4.83	3.90	3.81	2.79	2.42	5.53
Toccoa, Ga	8.01	1.75	2.29	4.19	6.29	8.38
West Point, Ga	4.59	5.83	2.02	7.76	8.81	5.97
Montgomery, Ala.:						
Birmingham, Ala	6.48	3.49	3.96	3.31	6.97	2.33
Calera, Ala	5.21	4.40	4.05	2.52	5.65	1.26
Eufaula, Ala	3.02	1.96	4.59	4.71	6.06	1.85
Fort Deposit, Ala	5.08	2.90	3.10	3.99	4.35	2.87
Greenville, Ala	14.45	9.16	2.17	3.54	3.39	1.70
Marion, Ala	3.03	1.07	4.47	4.56	2.57	(1)
Montgomery, Ala	8.92	4.32	7.54	3.93	4.83	2.38
Opelika, Ala	7.13	3.33	6.98	3.75	6.43	4.56
Pine Apple, Ala	3.95	2.83	0.92	3.24	2.88	1.75
Selma, Ala	2.64	1.23	5.75	1.95	0.25	0.30
Mobile, Ala.:						
Aberdeen, Miss	4.82	2.44	2.80	2.56	6.83	2.87
Columbus, Miss	6.44	4.30	4.59	2.36	6.97	2.82
Evergreen, Ala	(1)	(1)	(2)	4.35	6.61	1.36
Livingston, Ala	3.68	(1)	0.25	2.74	3.52	3.37
Macon, Miss	7.31	0.15	3.39	1.93	6.49	3.11
Meridian, Miss	2.00	(1)	0.23	0.18	0.31	0.02
Mobile, Ala	3.27	4.15	3.81	6.07	9.25	1.19
Okolona, Miss	5.23	2.50	1.01	2.02	3.46	2.25
Waynesborough, Miss	3.13	2.50	7.30	3.75	4.99	1.59
New Orleans, La.:						
Alexandria, La	3.56	2.56	4.27	2.94	4.34	1.35
Amite City, La	0.09	0.11	0.20	0.06	0.07	0.03
Brookhaven, Miss	0.84	4.07	6.99	4.62	5.93	1.77
Cheneyville, La	2.88	3.62	2.62	5.40	3.91	0.03
Coushatta Chute, La	2.86	3.82	4.33	3.21	4.26	2.25
Hazlehurst, Miss	0.11	0.37	0.46	0.30	1.23	0.00
Lafayette, La	5.84	4.11	7.37	6.76	7.70	0.18
Minden, La	2.41	2.70	4.30	1.51	3.75	2.01
Natchez, Miss	3.52	1.89	5.36	8.85	2.77	1.04
Natchitoches, La	3.87	2.38	3.57	2.52	6.25	1.54
New Orleans, La	5.77	3.30	6.15	4.25	13.55	0.56
Opelousas, La	4.77	4.22	2.43	5.71	4.84	0.16
Port Gibson, Miss	(1)	(2)	1.83	2.53	6.01	1.03
Shreveport, La	3.70	5.77	4.80	0.91	6.70	4.14
Galveston, Tex.:						
Austin, Tex	(1)	0.37	3.19	1.31	4.78	1.33
Belton, Tex	2.97	0.06	0.11	0.41	2.59	0.12
Brenham, Tex	(1)	(1)	(1)	(1)	2.24	1.45
Columbia, Tex	5.20	0.57	2.02	2.06	9.06	1.50
Corsicana, Tex	5.94	3.36	2.35	0.44	2.49	2.48
Cuero, Tex	4.03	0.30	5.37	3.48	3.43	1.25
Dallas, Tex	6.99	9.69	2.26	1.85	0.74	0.72
Galveston, Tex	6.41	3.26	2.20	1.74	26.01	2.20
Hearne, Tex	9.54	0.00	2.70	0.40	9.16	0.95
Houston, Tex	4.55	2.43	3.88	1.48	4.65	1.49
Huntsville, Tex	6.33	0.71	3.10	3.02	5.37	0.33
Longview, Tex	4.92	5.86	5.62	0.12	6.08	10.23
Luling, Tex	(1)	0.00	0.00	0.15	(1)	(1)
Orange, Tex	(1)	0.10	0.39	7.00	0.53	0.36
Palestine, Tex	6.08	2.07	(2)	1.87	4.63	1.47
San Antonio, Tex	[3]6.79	0.86	6.56	0.95	1.51	0.65
Sour Lake, Tex	[4]3.10	5.06	1.16	4.20	9.11	(2)
Tyler, Tex	2.08	1.24	1.80	0.00	2.35	0.50
Waco, Tex	12.44	2.22	2.47	0.73	6.85	0.50
Weatherford, Tex	7.50	4.23	1.00	2.50	2.75	1.90
Weimar, Tex	10.43	0.18	5.68	0.10	3.12	2.00
Vicksburg, Miss.:						
Edwards, Miss	2.59	0.81	4.05	1.54	12.15	1.10
Jackson, Miss	2.39	1.71	4.00	1.00	10.32	1.44
Lake, Miss	3.86	2.45	5.30	1.10	3.90	1.60
Monroe, La	3.43	4.10	4.48	4.85	6.51	0.81
Vicksburg, Miss	4.75	2.90	6.61	1.04	9.28	1.01
Little Rock, Ark.:						
Arkansas City, Ark	(1)	(2)	1.39	2.77	7.31	0.28
Brinkley, Ark	0.90	1.62	1.20	1.00	0.13	0.08
Devall's Bluff, Ark	4.23	2.71	2.00	1.23	2.16	1.52
Fort Smith, Ark	2.59	4.88	2.48	2.99	0.99	2.31
Helena, Ark	0.43	2.43	1.21	1.00	1.54	1.30

[1] No record. [2] Record incomplete. [3] For 23 days. [4] For 18 days.

Precipitation at the cotton-region stations of the Signal Service, &c.—Continued.

Districts and stations.	May.	June.	July.	August.	September.	October.
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*
Little Rock, Ark.—Continued:						
Kensett, Ark	[1]1.24	3.96	0.97	0.39	1.45	1.10
Little Rock, Ark	3.26	3.39	1.13	1.95	2.06	1.03
Madison, Ark	1.60	1.30	2.12	0.02	0.29	0.06
Magnolia, Ark	1.85	5.74	3.50	2.31	0.50	2.63
Malvern, Ark	6.11	3.67	1.02	1.83	2.05	0.80
Monticello, Ark	5.05	3.55	3.48	2.28	2.93	1.10
Newport, Ark	1.09	2.08	3.36	0.32	1.12	0.87
Paris, Tex	2.52	2.34	3.12	2.32	3.95	1.91
Pine Bluff, Ark	3.15	2.45	2.46	0.41	([2])	([2])
Prescott, Ark	2.16	1.17	0.90	0.04	0.27	0.13
Russellville, Ark	1.58	2.95	0.85	1.20	3.87	0.35
Texarkana, Ark	([2])	4.03	2.18	2.23	2.02	2.60
Memphis, Tenn.:						
Arlington, Tenn	0.15	0.30	0.19	0.14	0.29	0.04
Batesville, Miss	1.45	3.06	3.00	1.43	6.86	0.36
Bolivar, Tenn	2.40	5.95	2.00	0.85	5.16	1.20
Brownsville, Tenn	1.07	9.75	3.29	1.02	2.61	2.06
Corinth, Miss	0.33	0.38	0.31	0.01	0.08	([2])
Covington, Tenn	1.87	4.75	2.15	1.10	1.64	1.73
Decatur, Ala	5.92	4.76	3.79	3.74	3.25	3.00
Dyersburg, Tenn	3.25	7.12	4.59	1.04	2.94	1.74
Grand Junction, Tenn	2.26	6.56	4.47	0.66	6.80	1.68
Grenada, Miss	2.57	1.95	1.23	1.51	4.08	([2])
Hernando, Miss	0.60	4.03	2.37	1.65	5.58	1.64
Holly Springs, Miss	2.32	4.60	2.35	1.46	6.80	2.47
Memphis, Tenn	3.05	1.52	4.80	1.70	4.40	0.93
Milan, Tenn	3.17	5.10	3.70	0.56	2.63	3.79
Nashville, Tenn	4.32	3.70	5.19	0.96	5.49	3.01
Oxford, Miss	1.52	6.68	1.33	1.25	5.45	0.75
Paris, Tenn	2.99	5.25	2.16	0.00	2.13	2.24
Scottsborough, Ala	7.45	5.93	6.40	3.43	4.07	5.72
Tuscumbia, Ala	3.54	0.63	1.23	2.64	7.37	2.63

[1] For 24 days. [2] No record.

APPENDIX 46.

Monthly maximum and minimum temperatures (in degrees Fahrenheit), and the precipitation, at third order stations of the Signal Service, United States Army, for the year 1885.

Stations of third order.	January. Temperature. Maximum.	January. Temperature. Minimum.	January. Precipitation.	February. Temperature. Maximum.	February. Temperature. Minimum.	February. Precipitation.	March. Temperature. Maximum.	March. Temperature. Minimum.	March. Precipitation.	April. Temperature. Maximum.	April. Temperature. Minimum.	April. Precipitation.	May. Temperature. Maximum.	May. Temperature. Minimum.	May. Precipitation.	June. Temperature. Maximum.	June. Temperature. Minimum.	June. Precipitation.
y at sunset:	°	°	In.	°	°	In.	°	°	In.	°	°	In.	°	°	In.	°	°	In.
	66	19	2.44	60	22	4.55	79	25	0.01	84	25	1.52	92	52	3.74	88	36	3.40
	58	27	0.78	56	34	10.59	67	36	1.51	71	35	1.08	75	42	3.48	71	43	2.78
	64	18	0.53	77.5	25	1.81	82	37	2.19	88	23	0.00	96	47	0.19	100	51	0.68
													(4)	(4)	(4)	99.2	52.5	1.88
ho.	48	-22.5	3.43	65	12	2.34	72	21	0.70	73	22	0.00	56	29	2.57	87	41	3.11
	48	2	2.31	60	13	3.14	68	19	0.47	71	15	1.06	83	20	1.58	80	29	1.88
	50.2	8.2	2.86	(4)	(4)	(4)	66	25	0.20	76	19	0.92	83	26.5	1.47	(4)	(4)	(4)
	68	-1	0.28	82.5	12	0.17	85.5	21	1.02	94	31.8	0.44	92	38	0.82	101.8	45.5	0.97
	61	12	2.23	57	21	2.93	70	23	0.61	75	17	2.85	85	32	1.66	(4)	(4)	(4)
	52.5	5.5	4.57	45.4	8.2	1.44	52.5	5.4	1.10	70.8	27.8	1.07	77.2	38.6	2.89	88.7	51.2	1.65
	70	24.7	0.00	80	27	0.45	93	36.5	0.15	95	42	0.00	111	50.5	0.16	109	57	0.04
	76	18.5	0.00	76	22.5	2.50	90	42	0.60	98	41	0.00	110.5	46.5	0.00	109.5	53	0.00
	39	-32	0.58	29	-49	0.40	49	-35	1.48	51	1	0.77	72	25	1.42	(4)	(4)	(4)
	57	zero.	5.72	48	zero.	1.75	59	5	1.02	71	27	2.67	83	32	3.49	88	43	1.56
	57	27	17.70	56	31	18.50	65	25	4.45	69	31	0.50	68	37	5.70	70	40	1.60
	64	16.4	3.61	55.9	7.2	2.39	53.2	10.6	2.37	70	32.2	1.55	75.9	30.3	5.36	(4)	(4)	(4)
	(4)	-29	4.00	(4)	-52	3.95	(4)	-36	2.05	(4)	-4	3.20	(4)	(4)	(4)	(4)	(4)	(4)
	82.1	22.2	0.00	86.6	22.1	0.47	91.8	28.5	0.33	96.6	30.2	0.00	112.7	34.7	0.65	109.8	32.8	0.04
	55	1.5	6.00	49	4	1.57	53	5	0.92	65	27	2.25	65.6	33.2	3.43	75	44	1.93
	52	24.6	14.31	58	28	12.87	61	32	2.07	67	30	1.13	82	36	2.63	73	38	2.17
	62.5	4	0.12	70	0.5	0.37	75.6	21.6	2.20	87.7	36.5	2.88	90.4	37	9.84	95.3	(4)	2.41
s	68.6	11.8	0.05	72.8	18.4	1.39	82.3	34.4	1.29	90.4	(4)	0.03	102.4	(4)	0.22	107.5	46.2	0.47
	45	-10	0.29	51	9	1.40	75	20	0.60	80	20	0.10	87	28	1.55	90	37	0.59
	61	-13.6	0.38	72	1	0.74	79	18	1.48	88	35.5	3.60	87	36	7.56	94.5	53.5	5.44
	46	-2	1.22	40	-21	0.65	55	-39	1.08	56	17	1.75	61	25	1.74	76	30	2.08
	64.5	15.5	0.00	78.5	21	1.15	80.5	30.5	2.25	87	38.5	0.69	99	41	0.19	90.5	46	0.55
	68	12	4.90	71	11	6.06	64	29	2.44	80	30.5	3.75	86	42	4.47	94.5	60	2.70
	76	20	(4)	78.5	22	0.33	84.6	33	0.50	94	34.5	0.57	106	44.5	0.55	105	44.5	0.05
	70	12	0.05	76	12.5	0.69	82	25	1.52	90	22	0.03	106.5	34.6	(4)	103.5	40	0.24
	60.3	-22.1	0.80	56	-34.2	0.73	63.5	-4.5	0.44	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)

Monthly maximum and minimum temperatures (in degrees Fahrenheit), and the precipitation, at third order stations of the Signal Service, United States Army, for the year 1885—Continued.

Stations of third order.	January.			February.			March.			April.			May.			June.		
	Temperature.			Temperature.			Temperature.			Temperature.			Temperature.			Temperature.		
	Maximum.	Minimum.	Precipitation.	Maximum.	Minimum.	Precipitation.	Maximum.	Minimum.	Precipitation.	Maximum.	Minimum.	Precipitation.	Maximum.	Minimum.	Precipitation.	Maximum.	Minimum.	Precipitation.
Taking two observations daily at 3 and 11 p. m., 75th meridian time:	°	°	In.	°	°	In	°	°	In.	°	°	In.	°	°	In.	°	°	In.
Anvik, Alaska	23	—30	0.32	18	—53	0.52	46	—43	1.77	45	—1	0.98	64	14	0.47	(4)	(4)	......
Atka, Alaska	42	24	9.10	41	12	3.94	46	18	1.76	45	21	10.41	(4)	(4)	(4)	(4)	(4)	......
Hoochnohoo, Alaska	47	4	1.88	44	9	0.89	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	76	41	0.49
Kenai, Alaska	(4)	—19	5.16	(4)	—24	3.32	(4)	—24	14.58	(4)	20	(4)	(4)	20	(4)	(4)	32	......
Koskokvim, Alaska	(4)	(5)	(5)	(4)	—40	0.42	(4)	—36	1.05	(4)	9	1.39	(4)	(4)	(4)	(4)	(4)	......
Pyramid Harbor, Alaska	39	(4)	0.68	43	(4)	0.93	52	(4)	1.80	55	(4)	0.71	73	(4)	0.08	82	(4)	0.32
Tcha-tow-klin, Alaska	14	—63	0.28	30	—52	0.70	56	—56	0.41	62	9	0.92	(5)	(5)	(5)	(4)	(4)	......

[1] Observations discontinued October 31, 1885.
[2] Observations commenced May 17, 1885.
[3] Inappreciable.
[4] No record.
[5] Record incomplete.

Monthly maximum and minimum temperatures (in degrees Fahrenheit), and the precipitation, at third order stations of the Signal Service, United States Army, for the year 1885—Continued.

Stations of the third order.	July. Temperature. Maximum.	July. Temperature. Minimum.	July. Precipitation.	August. Temperature. Maximum.	August. Temperature. Minimum.	August. Precipitation.	September. Temperature. Maximum.	September. Temperature. Minimum.	September. Precipitation.	October. Temperature. Maximum.	October. Temperature. Minimum.	October. Precipitation.	November. Temperature. Maximum.	November. Temperature. Minimum.	November. Precipitation.	December. Temperature. Maximum.	December. Temperature. Minimum.	December. Precipitation.	Annual precipitation.
...y at sunset:			In.	°	°	In.	°	°	In.	°	°	In.	°	°	In.	°	°	In.	In.
......			0.02	98	42	0.00	90	34	1.18	93	31	1.53	66	20	8.02	60	26	3.32	28.73
......			0.04	74	51	0.02	74	49	4.24	75	42	3.44	63	36	12.43	56	39	9.55	56.10
......			1.83	99	53	2.10	96	37	0.44	98	35	0.00	84	30	1.42	74	20	1.74	13.00
......			3.40	98.1	53.5	3.40	91.1	43.5	1.26	70	37.5	2.06	72	27.1	4.05	62.1	17	3.70	......
...ho			0.40	93	41	(3)	87	35	1.21	75	23	1.20	60	23	5.28	57	−1	1.48	20.72
......			0.00	(4)	(4)	(4)	56	21	0.86	81	17	0.43	58	12	7.20	54	16	4.00	......
......	97	40	0.25	101	46.2	0.43	96	31	0.02	95.2	27	0.32	71	21.5	6.57	50	5	2.15	......
......	107.8	58	2.27	105.8	57	1.78	102	48	0.06	86.5	30	0.09	60	19.8	0.20	60.2	0.2	1.15	9.25
......	95	46	0.00	93	44	0.00	82	32.5	(4)	(4)	(4)	(4)	53	23	3.70	50	19	2.33	......
......	89.7	56.8	4.48	87.5	49.6	3.60	82.9	44.7	1.43	73.9	34.0	3.76	65.5	28.6	8.05	54	14	8.30	35.09
......	113.4	63	0.48	114	67	0.92	108.5	44.0	(3)	102	43.3	0.00	88	35.9	0.56	78.3	23	0.10	2.97
......	114	70.5	0.00	115	67	0.00	111.5	51.5	0.00	104.5	38.5	0.40	95	33	1.75	83.5	16	1.25	8.80
......	(4)	(4)	(4)	(4)	(4)	(4)	64	24	0.96	60	14	1.53	83	−33	1.07	37	−33	0.91	......
......	92	48	0.63	84	46.5	0.90	80.2	30	1.30	72	33	5.97	68	23	2.34	58	11	2.25	35.71
......	76	36	0.25	73	46	0.05	70	44	12.15	63	34	7.05	59	34	10.60	58	27	13.00	101.45
......	91.3	60.5	1.27	88.4	52.2	2.14	82.1	43.4	0.63	74.7	30.4	2.34	66.8	31	4.56	60.1	14.9	4.40	......
......	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	......
......	113.4	46.2	0.18	114.9	48.9	0.71	112.7	43.9	0.07	104.8	29.7	0.09	96.2	31.2	0.91	29.2	20.2	0.32	8.77
......	(5)	(5)	(3)	(5)	(5)	(5)	(5)	(5)	(5)	68.2	32.5	5.35	......	......	......	......	......	......	......
......	79.5	44	0.26	76	42	0.00	72	42	9.44	68.5	35	5.85	57	31	13.07	64.5	25	7.93	71.23
......	98.0	(5)	1.80	98.4	55	8.74	95.4	50.2	3.62	89.2	28.1	1.31	84.3	28.5	1.45	71.5	(5)	2.05	38.79
......	111.8	59.6	1.25	110.3	63	1.22	101.8	49	0.84	94.1	22.6	0.34	80.4	27.7	0.70	69.4	17	0.00	8.19
......	101	40	0.00	105	44	0.38	88	34	1.14	81.4	17	0.03	56	20	2.07	52	8.7	0.44	11.28
......	96	62	4.17	97.5	54	0.62	91.2	50.5	3.41	84.4	20.5	1.00	63	23	1.07	70	−3	3.19	37.66
......	77	36	3.08	70	32	4.77	75	22	3.99	56	12	2.41	37	−27	0.78	(5)	26	2.11	25.60
......	108	53	0.84	107	63	3.01	90	46	0.03	92.5	37	0.61	82	28	1.68	69.5	19	0.52	11.22
......	(5)	(5)	(4)	(4)	(4)	(4)	88	50	0.75	71	29	5.00	65	22	0.18	62	10	4.02	......
......	112	56	0.36	112	65	2.10	106.5	48.5	0.04	99	29	0.21	87	20	1.36	82	24	2.25	8.32
......	107	56.5	1.76	108	50.5	2.10	100	42	1.11	93	27	0.00	82	19	0.56	81.5	7	0.10	......
......	(4)	(4)	(4)	(4)	(4)	(4)	(5)	(4)	(5)	85.3	14.6	0.36	53.4	11.7	0.34	57.3	−9.4	0.05	......

[1] Observations discontinued October 31, 1885.
[2] Observations commenced May 17, 1885.
[3] Inappreciable.
[4] No record.
[5] Record incomplete.

Monthly maximum and minimum temperature (in degrees Fahrenheit), and the precipitation, at third order stations of the Signal Service, United States Army, for the year 1885—Continued.

Stations of the third order.	July. Temperature. Maximum.	July. Temperature. Minimum.	July. Precipitation.	August. Temperature. Maximum.	August. Temperature. Minimum.	August. Precipitation.	September. Temperature. Maximum.	September. Temperature. Minimum.	September. Precipitation.	October. Temperature. Maximum.	October. Temperature. Minimum.	October. Precipitation.	November. Temperature. Maximum.	November. Temperature. Minimum.	November. Precipitation.	December. Temperature. Maximum.	December. Temperature. Minimum.	December. Precipitation.	Annual precipitation.
Tab 11 fly at 3 and .6:	°	°	*In.*	°	°	*In.*	°	°	*In.*	°	°	*In.*	°	°	*In.*	°	°	*In.*	*In.*
....	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	......
....	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	......
....	79	42	1.00	72	39	2.07	67	31	5.04	48	16	6.43	(1)	(1)	(1)	(1)	(1)	(1)	......
....	(2)	38	(2)	(2)	30	(2)	(2)	21	(2)	(2)	14	(2)	(2)	-16	(1)	(1)	-37	(1)	......
....	(1)	(1)	(1)	(1)	34	5.67	(1)	(1)	(1)	54	9	0.06	32	-41	1.50	39	-53	0.63	......
....	77	(1)	0.01	71	(1)	0.81	63	(1)	0.45	57	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	......
....	(1)	(1)	(1)	80	20	0.48	78	8	0.96	59	1	1.32	21	-45	1.27	28	-60	0.72	......

[1] No record.
[2] Record incomplete.

APPENDIX 47.

Mean maximum and mean minimum temperatures (in degrees Fahrenheit), and the number ... Service, United States Army,

Stations of the third order	January. Temp. Mean max.	January. Temp. Mean min.	January. Precipitation.	February. Temp. Mean max.	February. Temp. Mean min.	February. Precipitation.	March. Temp. Mean max.	March. Temp. Mean min.	March. Precipitation.	April. Temp. Mean max.	April. Temp. Mean min.	April. Precipitation.	May. Temp. Mean max.	May. Temp. Mean min.	May. Precipitation.
Taking one observation daily at sunset:	°	°	Dys.			Dys.	°	°	Dys.			Dys.	°	°	Dys.
Ashland, Oreg	51.4	30.4	14	5[illegible]	[illegible]9	17	70.1	34.8	1	7[illegible]		10	75.8	43.8	9
Astoria, Oreg	45.5	35.6	21	5[illegible]	[illegible]6	23	57.0	42.6	10	5[illegible]		7	61.2	48.0	13
Bowie, Fort, Ariz	55.0	28.5	3	6[illegible]	[illegible]5	3	67.3	42.5	7	7[illegible]		0	83.5	55.4	5
Cape Henlopen, Del.[2]	..	..	..			....	...	...	...			..	(2)	(2)	(2)
Cœur d'Alene, Fort, Idaho	30.4	15.0	12	3[illegible]	[illegible]4	16	50.7	20.6	4	6[illegible]		0	68.3	40.5	11
Klamath, Fort, Oreg	37.2	19.2	12	4[illegible]	[illegible]1	16	50.6	28.0	2	6[illegible]		(3)	66.5	35.1	6
Lakeview, Oreg	20.4	22.8	11	[illegible]	[illegible]	(4)	60.0	32.0	1	6[illegible]		8	64.6	38.5	6
Lava, N. Mex	57.7	19.0	2	6[illegible]	[illegible]5	4	71.1	35.0	10	7[illegible]		4	83.1	44.8	5
Linkville, Oreg	42.4	26.0	8	4[illegible]	[illegible]6	0	61.4	33.2	3	6[illegible]		7	69.0	42.0	3
Little Egg Harbor, N. J	39.5	24.0	12	3[illegible]	[illegible]3	8	38.0	23.7	10	5[illegible]		9	61.0	49.2	11
Maricopa, Ariz	64.5	33.8	0	7[illegible]	[illegible]1	2	70.1	47.8	1	8[illegible]		0	96.4	14.2	3
McDowell, Fort, Ariz	65.9	20.3	0	7[illegible]	[illegible]8	2	80.4	45.4	1	8[illegible]		0	95.5	58.8	6
Mission, Alaska	16.4	1.1	9	[illegible]	[illegible]6	5	26.1	0.2	13	4[illegible]		12	58.4	36.6	9
Narragansett Pier, R. I	38.7	20.7	14	3[illegible]	[illegible]7	12	38.3	19.5	13	5[illegible]		9	60.8	44.0	13
Neah Bay, Wash	44.5	34.9	20	4[illegible]	[illegible]9	25	54.9	41.8	10	5[illegible]		4	60.7	40.1	12
Ocean City, Md	46.6	31.1	7	3[illegible]	[illegible]7	0	41.8	27.6	10	5[illegible]		8	65.2	51.2	15
Omilak, Alaska	(4)	-2.5	9	[illegible]	[illegible]3	4	(4)	0.1	4	[illegible]		6	(4)	(4)	(4)
Phœnix, Ariz	69.2	31.2	0	7[illegible]	[illegible]9	2	81.0	37.8	3	8[illegible]		0	96.9	41.0	1
Point Judith, R. I.[1]	38.0	22.1	14	3[illegible]	[illegible]1	9	36.6	20.9	7	5[illegible]		6	58.4	45.1	10
Pysht, Wash	41.5	32.1	16	4[illegible]	[illegible]2	25	55.0	39.0	10	5[illegible]		7	64.5	44.0	15
Reno, Fort, Ind. T	34.0	17.7	4	4[illegible]	[illegible]8	2	60.3	38.1	7	7[illegible]		6	75.2	52.9	11
San Carlos Agency, Ariz	55.0	21.0	1	6[illegible]	[illegible]2	3	72.3	44.4	6	7[illegible]		1	90.2	(4)	4
Spokane, Fort, Wash	26.2	5.1	5	[illegible]	[illegible]	(4)	65.7	26.4	0	6[illegible]		1	73.4	34.0	6
Supply, Fort, Ind. T	34.6	13.2	4	4[illegible]	[illegible]4	3	57.0	33.4	6	67.0	40.3	10	74.2	52.2	14
Ugashik, Alaska	37.5	22.3	10	2[illegible]	[illegible]0	10	32.4	25.8	10	43.0	26.1	17	50.0	32.8	15
Verde, Fort, Ariz	52.6	26.0	0	6[illegible]	[illegible]0	6	70.1	38.8	7	70.5	47.0	3	85.6	52.5	3
Wash Woods, N. C	52.3	33.4	13	4[illegible]	[illegible]9	8	47.3	32.3	11	64.3	47.6	12	71.2	55.3	18
Wickenburg, Ariz	63.0	28.7	0	7[illegible]	[illegible]4	3	76.7	43.6	8	80.8	45.0	3	90.6	51.1	7
Willcox, Ariz	61.8	21.9	3	7[illegible]	[illegible]0	2	71.0	38.2	8	70.0	39.2	2	96.9	45.6	6
Yates, Fort, Dak	14.8	0.2	4	1[illegible]	[illegible]8	10	45.2	10.0	8	(3)	(3)	(3)	(4)	(4)	(4)
Two observations daily, 3 and 11 p. m., 75th meridian time:															
Anvik, Alaska	4.6	3.0	8	-[illegible]	[illegible]4	9	22.4	5.6	13	30.0	24.4	15	53.3	34.5	8
Atka, Alaska	37.8	30.5	27	3[illegible]	[illegible]8	14	37.3	29.0	8	41.0	30.3	27	(4)	(4)	(4)
Hoochnohoo, Alaska	33.7	22.5	7	3[illegible]	[illegible]8	3	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)
Kenai, Alaska	(4)	5.3	3	[illegible]	[illegible]8	0	(4)	17.4	14	(4)	29.2	(4)	(4)	(4)	(4)
Koskokvim, Alaska	(4)	(2)	(4)	(4)	-12.7	11	(4)	24.5	9	(4)	25.8	17	(4)	(4)	(4)
Pyramid Harbor, Alaska	27.0	(4)	11	35.0	(4)	15	41.0	(4)	11	50.0	(4)	8	62.0	(4)	[illegible]
Tcha-tow-klin, Alaska	-8.4	25.2	6	5.5	16.7	8	28.9	-1.0	8	53.1	23.4	9	(4)	(4)	(4)

[1] Observations discontinued October 31, 1885. [2] Observations commenced May 17, 1885.

APPENDIX 47.

of days on which .01 *inch or more of precipitation fell at third order stations of the Signal for each month of the year* 1885.

[3] Record incomplete. [4] No record.

APPENDIX 48.

Mean relative humidity at stations of the Signal Service, United States Army, for each month and the year.

[Computed from the commencement of observations to December, 1885, inclusive. Observations prior to August 25, 1872, were taken at 7.35 a. m., 4.35, and 11.35 p. m., Washington time; from August 25, 1872, to November 1, 1879, at 7.35 a. m., 4.35, and 11 p. m., Washington time; from November 1, 1879, to December 31, 1884, at 7 a. m., 3, and 11 p. m., Washington time; and from January 1 to December 31, 1885, at 7 a. m., 3, and 11 p. m., 75th meridian time.]

Districts and stations.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.
New England.													
Eastport, Me	77	76	75	72	74	76	79	79	80	77	75	77	76
Portland, Me	72	70	66	64	65	68	71	73	74	72	72	74	70
Mount Washington, N. H	85	84	86	87	84	83	87	86	85	88	87	84	86
Boston, Mass	72	70	70	66	65	68	70	73	73	70	71	72	70
Block Island, R. I	76	78	75	76	83	83	83	82	82	79	78	79	79
New Haven, Conn	74	74	70	65	67	70	72	75	75	73	72	74	72
New London, Conn	74	72	72	68	70	74	76	78	77	75	72	73	73
Middle Atlantic States:													
Albany, N. Y	75	74	71	63	62	66	67	68	72	72	74	76	70
New York City	74	73	68	65	66	69	71	72	72	70	70	73	70
Philadelphia, Pa	74	70	67	64	65	68	68	72	71	70	69	73	69
Atlantic City, N. J	80	78	78	77	80	82	82	82	81	79	78	80	80
Barnegat City, N. J.[1]	81	79	76	75	77	79	80	80	80	79	78	80	79
Cape May, N. J.[2]	78	77	76	75	77	80	80	81	77	75	73	76	77
Sandy Hook, N. J	77	76	74	72	72	73	74	75	76	73	73	75	74
Baltimore, Md	70	67	65	60	61	64	64	69	70	69	66	68	66
Washington City	74	69	66	62	64	67	67	72	73	72	71	72	69
Cape Henry, Va	77	74	73	71	73	74	75	78	76	73	71	73	74
Chincoteague, Va	82	80	76	77	82	82	82	83	81	80	78	79	80
Lynchburg, Va	68	66	57	58	61	67	66	71	70	69	66	67	65
Norfolk, Va	75	71	67	68	69	70	71	76	76	75	73	72	72
South Atlantic States:													
Charlotte, N. C	73	67	63	62	62	64	65	69	70	70	68	70	67
Hatteras, N. C	85	81	78	80	82	83	81	82	81	81	79	81	81
Kitty Hawk, N. C	80	76	76	76	79	79	79	81	80	78	76	77	79
Macon, Fort, N. C	83	81	77	81	81	84	83	84	84	83	81	81	82
Smithville, N. C	81	77	76	78	77	77	78	80	80	79	73	78	78
Wilmington, N. C	72	69	68	68	71	74	75	79	77	75	72	72	73
Charleston, S. C	76	72	70	71	72	74	75	77	77	77	74	74	74
Augusta, Ga	73	68	65	65	65	69	69	73	73	72	72	73	70
Savannah, Ga	72	69	68	66	69	72	72	76	78	76	73	71	72
Jacksonville, Fla	75	71	67	68	69	72	72	75	78	75	75	74	73
Florida Peninsula:													
Cedar Keys, Fla	81	76	73	74	71	75	74	76	77	77	79	82	76
Key West, Fla	80	77	71	70	71	71	70	72	76	76	78	79	74
Sanford, Fla	78	74	72	71	73	81	77	80	83	80	81	76	77
Eastern Gulf States:													
Atlanta, Ga	72	64	60	61	63	67	67	73	71	71	66	69	67
Pensacola, Fla	77	76	74	77	74	77	78	79	78	75	74	77	76
Mobile, Ala	78	74	73	73	71	74	76	78	75	75	76	78	75
Montgomery, Ala	74	67	65	65	65	69	70	72	70	69	71	73	69
Vicksburg, Miss	71	66	64	66	68	70	72	72	72	72	70	70	70
New Orleans, La	72	69	70	70	70	72	73	74	73	71	72	73	72
Western Gulf States:													
Shreveport, La	74	70	66	67	70	70	72	70	71	73	72	72	71
Fort Smith, Ark	75	72	64	68	72	76	76	74	72	76	68	71	72
Little Rock, Ark	75	73	66	68	75	76	75	76	77	77	73	72	74
Galveston, Tex	79	78	79	76	74	73	73	73	74	74	77	80	76
Indianola, Tex	82	78	80	77	78	76	76	76	78	76	78	81	78
Palestine, Tex	69	68	65	72	76	77	74	72	72	74	69	69	71
San Antonio, Tex	72	68	67	75	70	69	64	67	70	69	68	70	68
Rio Grande Valley:													
Brownsville, Tex	79	79	80	76	77	74	73	75	78	78	78	80	78
Rio Grande City, Tex	72	66	71	67	69	67	69	67	69	72	66	68	68

[1] Station closed December 31, 1885.

[2] Station closed October 31, 1885.

Mean relative humidity at stations of the Signal Service, &c.—Continued.

Districts and stations.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
	P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
Ohio Valley and Tennessee:													
Chattanooga, Tenn	75	68	64	64	68	72	72	77	77	76	71	72	71
Knoxville, Tenn	76	69	64	61	65	73	73	74	72	72	72	75	70
Memphis, Tenn	73	68	62	62	65	69	70	70	71	71	68	71	68
Nashville, Tenn	73	70	64	63	63	68	69	69	70	69	70	72	68
Louisville, Ky	72	68	63	59	62	67	67	67	69	68	68	71	67
Greencastle, Ind	81	81	74	71	69	75	76	77	76	76	77	81	76
Indianapolis, Ind	74	71	67	60	61	68	68	68	68	68	71	74	68
Cincinnati, Ohio	73	70	66	60	60	65	64	66	67	67	69	72	66
Columbus, Ohio	74	72	67	64	64	66	64	67	69	71	71	75	68
Pittsburg, Pa	76	73	69	63	63	66	68	70	71	71	71	76	70
Lower Lakes:													
Buffalo, N. Y	80	78	75	71	68	71	72	71	72	73	76	79	74
Oswego, N. Y	74	74	73	68	67	70	71	71	71	71	71	76	78
Rochester, N. Y	80	77	76	67	64	67	68	68	70	72	76	80	72
Erie, Pa	79	78	76	70	66	70	70	70	72	72	75	79	73
Cleveland, Ohio	78	75	75	67	65	69	70	70	70	70	74	78	72
Sandusky, Ohio	76	74	74	68	66	69	69	69	71	72	73	76	71
Toledo, Ohio	75	74	70	64	63	68	69	71	72	71	72	75	70
Detroit, Mich	77	75	73	64	63	69	70	71	72	71	74	78	71
Upper Lakes:													
Alpena, Mich	77	74	76	70	70	73	73	76	77	78	82	80	75
Escanaba, Mich	75	72	71	69	69	72	72	76	77	76	78	78	74
Grand Haven, Mich	78	76	76	67	67	72	73	75	75	74	76	79	74
Mackinaw City, Mich	75	74	72	71	72	74	75	77	77	74	78	79	75
Marquette, Mich	78	72	72	66	64	68	68	70	70	70	74	76	70
Port Huron, Mich	80	79	78	72	69	73	74	73	74	75	80	82	76
Chicago, Ill	75	73	72	67	68	71	71	71	69	70	72	75	71
Milwaukee, Wis	79	78	76	71	69	73	74	75	74	73	76	79	75
Duluth, Minn	75	72	69	67	68	72	68	73	73	70	76	76	72
Upper Mississippi Valley:													
Saint Paul, Minn	74	70	69	62	62	70	71	72	71	70	73	75	70
La Crosse, Wis	72	71	69	62	59	68	70	69	72	68	72	74	69
Davenport, Iowa	73	72	69	63	64	70	69	68	69	67	70	74	69
Des Moines, Iowa	70	69	68	64	66	73	72	70	70	71	70	73	70
Dubuque, Iowa	67	68	67	61	61	69	67	69	70	69	71	71	67
Keokuk, Iowa	75	73	69	65	65	71	69	68	68	69	71	75	70
Cairo, Ill	74	70	64	62	67	73	72	72	73	71	69	72	70
Springfield, Ill	72	69	64	63	65	71	65	65	66	69	67	71	68
Saint Louis, Mo	72	70	66	61	65	69	69	67	66	66	68	72	68
Missouri Valley:													
Leavenworth, Kans	73	70	65	62	65	67	68	65	64	64	65	71	67
Omaha, Nebr	73	72	68	61	65	69	71	70	70	66	70	73	69
Bennett, Fort, Dak.[1]	73	73	72	67	67	70	68	65	63	65	72	74	69
Huron, Dak	65	68	70	69	71	75	77	76	72	70	70	67	71
Yankton, Dak	68	69	68	66	66	71	72	71	68	65	68	71	68
Extreme Northwest:													
Moorhead, Minn	81	79	78	74	68	72	74	73	72	75	81	84	76
Saint Vincent, Minn	91	84	84	78	71	76	80	81	78	79	83	86	81
Bismarck, Dak	78	78	75	68	64	67	64	63	63	65	74	75	70
Buford, Fort, Dak	75	74	76	69	63	69	67	63	62	67	77	77	70
Totten, Fort, Dak	72	75	83	77	68	76	77	74	69	70	84	78	75
Northern Slope:													
Assinaboine, Fort, Mont	66	68	68	60	55	56	54	53	57	61	64	62	60
Benton, Fort, Mont	70	72	64	62	63	61	51	50	57	62	62	63	62
Custer, Fort, Mont	74	73	68	61	62	65	52	47	54	58	65	69	62
Helena, Mont	74	70	67	61	56	59	52	49	57	62	63	64	62
Maginnis, Fort, Mont	53	49	46	53	54	51	53	51	57	59	54	51	58
Poplar River, Mont	91	92	92	82	69	73	75	73	69	72	77	86	80
Shaw, Fort, Mont	73	70	63	58	56	59	55	54	58	62	62	63	61
Deadwood, Dak	68	69	69	69	68	67	64	61	60	63	66	68	67
Cheyenne, Wyo	55	57	57	59	59	50	50	50	45	48	52	57	52
North Platte, Nebr	70	68	64	60	65	64	66	65	62	63	65	70	65
Middle Slope:													
Denver, Colo	54	54	49	50	50	44	47	48	44	46	50	56	49
Pike's Peak, Colo	68	70	73	77	73	66	66	68	68	70	68	71	70
West Las Animas, Colo	72	66	51	49	58	57	53	58	52	59	61	69	61
Dodge City, Kans	69	67	60	55	65	63	61	65	60	63	62	67	63
Elliott, Fort, Tex	62	56	49	49	50	56	55	56	56	63	54	55	55
Southern Slope:													
Sill, Fort, Ind. Ter	68	66	60	57	67	67	64	62	65	66	66	70	65
Concho, Fort, Tex.[2]	68	64	60	58	63	60	58	62	66	69	66	65	64
Davis, Fort, Tex	57	49	48	40	47	48	55	58	60	55	54	54	53
Stockton, Fort, Tex	57	53	52	48	50	57	54	55	62	61	59	59	55
Southern Plateau:													
Santa Fé, N. Mex	53	54	44	37	32	31	47	51	44	43	50	53	44

[1] Station closed November 30, 1885.

[2] Station closed September 15, 1885.

Mean relative humidity at stations of the Signal Service, &c.—Continued.

Districts and stations.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
	P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
Southern Plateau—Continued:													
El Paso, Tex	52	48	40	33	34	36	46	52	54	55	55	55	48
Apache, Fort, Ariz	63	61	58	46	40	37	65	64	52	51	56	61	54
Grant, Fort, Ariz	60	48	42	31	25	26	45	54	41	38	42	49	41
Prescott, Ariz	67	56	51	45	34	30	46	53	44	44	51	59	49
Thomas, Fort, Ariz	65	61	56	41	36	34	45	54	48	48	57	66	51
Yuma, Ariz	46	45	44	42	37	38	42	46	44	44	45	59	44
Middle Plateau:													
Winnemucca, Nev	63	62	50	51	41	35	23	22	29	44	59	64	46
Salt Lake City, Utah	59	58	50	48	42	35	32	33	34	44	53	61	46
Northern Plateau:													
Boisé City, Idaho	77	75	65	60	56	51	42	42	50	62	70	77	60
Lewiston, Idaho[1]	70	69	63	63	60	61	45	44	54	68	75	77	62
Dayton, Wash.[2]	81	76	68	64	62	60	52	50	58	68	80	82	67
Spokane Falls, Wash	81	80	75	67	60	61	54	54	65	76	81	80	70
North Pacific Coast:													
Canby, Fort, Wash	85	85	84	85	84	87	83	86	88	88	91	90	87
Olympia, Wash	85	84	82	78	72	70	68	73	80	84	86	86	79
Tatoosh Island, Wash	85	84	84	83	86	87	89	92	90	88	89	82	86
Portland, Oreg	79	79	75	70	65	65	64	67	70	78	79	80	72
Roseburg, Oreg	83	80	75	72	67	65	62	62	66	78	85	86	73
Middle Pacific Coast:													
Cape Mendocino, Cal	80	80	83	84	85	85	87	88	80	82	81	82	83
Red Bluff, Cal	73	70	62	64	51	40	34	34	41	51	66	75	55
Sacramento, Cal	79	75	70	70	63	59	55	55	55	62	71	80	67
San Francisco, Cal	74	74	73	73	73	75	79	80	78	74	73	76	75
South Pacific Coast:													
Los Angeles, Cal	63	67	72	71	71	70	70	69	70	66	62	64	68
San Diego, Cal	71	74	75	73	74	74	76	77	77	73	68	68	74
Alaska stations:													
Saint Michael's, Fort	96	96	96	94	91	84	82	86	86	89	91	93	91
Sitka	77	76	74	70	75	77	80	80	81	76	77	77	76
Unalashka	86	84	82	80	77	79	79	82	82	84	79	81	80
Behring's Island, Behring Sea	87	89	88	90	89	88	92	92	87	85	89	87	89

[1] Station closed December 31, 1885. [2] Station closed November 30, 1885.

APPENDIX 49.

Date of the first frost at stations of the Signal Service, United States Army, east of the Rocky Mountains, for the winter of 1885–'86.

Districts and stations.	Dates.
New England:	
Eastport, Me	Oct. 8
Portland, Me	Oct. 7
Mount Washington, N. H	(3)
Boston, Mass	Sept. 24
Block Island, R. I	Nov. 18
New Haven, Conn	Sept. 24
New London, Conn	Oct. 23
Middle Atlantic States:	
Albany, N. Y	Oct. 7
New York City	Oct. 7
Philadelphia, Pa	Oct. 23
Atlantic City, N. J	Oct. 23
Barnegat City, N. J.[2]	Nov. 18
Sandy Hook, N. J	Nov. 27
Baltimore, Md	Oct. 23
Washington City	Oct. 22
Cape Henry, Va	Dec. 3
Chincoteague, Va	Oct. 12
Lynchburg, Va	Oct. 5
Norfolk, Va	Oct. 22
South Atlantic States:	
Charlotte, N. C	Oct. 5
Hatteras, N. C	Dec. 26
Kitty Hawk, N. C	Dec. 6
Macon, Fort, N. C	Nov. 4
Smithville, N. C	Oct. 22
Wilmington, N. C	Oct. 22
Charleston, S. C	Oct. 23
Augusta, Ga	Oct. 22
Savannah, Ga	Nov. 15
Jacksonville, Fla	Nov. 16
Florida Peninsula:	
Cedar Keys, Fla	Dec. 6
Key West, Fla	(4)
Sanford, Fla	Nov. 25
Eastern Gulf States:	
Atlanta, Ga	Oct. 5
Pensacola, Fla	Oct. 22
Mobile, Ala	Oct. 22
Montgomery, Ala	Oct. 14
Vicksburg, Miss	Oct. 15
New Orleans, La	Dec. 3
Western Gulf States:	
Shreveport, La	Oct. 14
Fort Smith, Ark	Oct. 4
Little Rock, Ark	Oct. 14
Galveston, Tex	Jan. 7
Indianola, Tex	Dec. 14
Palestine, Tex	Oct. 14
San Antonio, Tex	Nov. 14
Rio Grande Valley:	
Brownsville, Tex	Dec. 15
Rio Grande City, Tex	Nov. 14
Ohio Valley and Tennessee:	
Chattanooga, Tenn	Oct. 5
Knoxville, Tenn	Oct. 7
Memphis, Tenn	Oct. 4
Nashville, Tenn	Sept. 24
Louisville, Ky	Sept. 24
Greencastle, Ind	Sept. 24
Indianapolis, Ind	Sept. 23
Cincinnati, Ohio	Sept. 24
Columbus, Ohio	Oct. 8
Pittsburg, Pa	Oct. 7
Lower Lakes:	
Buffalo, N. Y	Sept. 23
Lower Lakes—Continued:	
Oswego, N. Y	Oct. 7
Rochester, N. Y	Oct. 7
Erie, Pa	Oct. 17
Cleveland, Ohio	Oct. 24
Sandusky, Ohio	Oct. 7
Toledo, Ohio	Sept. 2
Detroit, Mich	Sept. 2
Upper Lakes:	
Alpena, Mich	Sept. 2
Escanaba, Mich	Aug. 25
Grand Haven, Mich	Sept. 6
Mackinaw City, Mich	Sept. 23
Marquette, Mich	Sept. 10
Port Huron, Mich	Sept. 2
Chicago, Ill	Sept. 1
Milwaukee, Wis	Oct. 4
Duluth, Minn	Sept. 2
Upper Mississippi Valley:	
Saint Paul, Minn	Sept. 5
La Crosse, Wis	Aug. 26
Davenport, Iowa	Oct. 6
Des Moines, Iowa	Oct. 4
Dubuque, Iowa	Aug. 26
Keokuk, Iowa	Oct. 4
Cairo, Ill	Oct. 4
Springfield, Ill	Oct. 6
Saint Louis, Mo	Oct. 3
Missouri Valley:	
Lamar, Mo	Oct. 4
Leavenworth, Kans	Oct. 4
Omaha, Nebr	Oct. 4
Valentine, Nebr	Sept. 9
Bennett, Fort, Dak[1]	Sept. 4
Huron, Dak	Sept. 1
Sully, Fort, Dak	Sept. 4
Yankton, Dak	Sept. 5
Extreme Northwest:	
Moorhead, Minn	Aug. 25
Saint Vincent, Minn	Aug. 24
Bismarck, Dak	Sept. 1
Buford, Fort, Dak	Sept. 1
Totten, Fort, Dak	Aug. 25
Northern Slope:	
Assinaboine, Fort, Mont	Oct. 3
Benton, Fort, Mont	Sept. 17
Custer, Fort, Mont	Oct. 3
Helena, Mont	Oct. 5
Maginnis, Fort, Mont	Sept. 5
Poplar River, Mont	Sept. 1
Shaw, Fort, Mont	Sept. 26
Deadwood, Dak	Sept. 1
Cheyenne, Wyo	Oct. 5
North Platte, Nebr	Oct. 1
Middle Slope:	
Denver, Colo	Oct. 6
Pike's Peak, Colo	(3)
West Las Animas, Colo	Sept. 13
Concordia, Kans	Oct. 4
Dodge City, Kans	Oct. 6
Elliott, Fort, Tex	Oct. 6
Southern Slope:	
Sill, Fort, Ind. T	Oct. 4
Abilene, Tex	Oct. 20
Davis, Fort, Tex	Oct. 13
Stockton, Fort, Tex	(5)
Stanton, Fort, N. Mex	Sept. 24

[1] Station closed November 30, 1885.
[2] Station closed December 31, 1885.
[3] Frost each month.
[4] No frost observed.
[5] No reliable records.

APPENDIX 50.

Date of the last frosts at stations of the Signal Service, United States Army, east of the Rocky Mountains, for the winter of 1885-'86.

District and stations.	Dates.
New England:	
Eastport, Me	Apr. 20
Portland, Me	Apr. 12
Mount Washington, N. H	(¹)
Boston, Mass	May 1
Block Island, R. I	Apr. 5
New Haven, Conn	June 1
New London, Conn	Apr. 9
Middle Atlantic States:	
Albany, N. Y	May 26
New York City	Apr. 5
Philadelphia, Pa	Apr. 9
Atlantic City, N. J	Apr. 9
Sandy Hook, N. J	Apr. 4
Baltimore, Md	May 17
Washington City	Mar. 18
Cape Henry, Va	Mar. 8
Chincoteague, Va	Mar. 18
Lynchburg, Va	Apr. 10
Norfolk, Va	Apr. 9
South Atlantic States:	
Charlotte, N. C	Mar. 14
Hatteras, N. C	Feb. 8
Kitty Hawk, N. C	Mar. 11
Macon, Fort, N. C	Mar. 11
Smithville, N. C	Mar. 24
Wilmington, N. C	Mar. 24
Charleston, S. C	Mar. 24
Augusta, Ga	Apr. 9
Savannah, Ga	Apr. 9
Jacksonville, Fla	Mar. 11
Florida Peninsula:	
Cedar Keys, Fla	Feb. 6
Key West, Fla	(²)
Sanford, Fla	Apr. 7
Eastern Gulf States:	
Atlanta, Ga	Apr. 8
Pensacola, Fla	Apr. 6
Mobile, Ala	Apr. 6
Montgomery, Ala	Apr. 6
Vicksburg, Miss	Apr. 6
New Orleans, La	Mar. 14
[illegible]	
[illegible]	Apr. 7
[illegible]	Apr. 1
[illegible]	Apr. 1
[illegible]	Feb. 5
[illegible]	Feb. 2
[illegible]	Apr. 7
[illegible]	Apr. 5
[illegible]	Jan. 30
[illegible]	Jan. 24
[illegible]see:	
[illegible]	Apr. 8
[illegible]	Apr. 9
[illegible]	Apr. 8
[illegible]	May 1
[illegible]	Apr. 9
[illegible]	May 17
[illegible]	Apr. 8
[illegible]	Apr. 9
[illegible]	May 17
[illegible]	June 4
[illegible]	May 17

Districts and stations.	Dates.
Lower Lakes—Continued:	
Oswego, N. Y	May 16
Rochester, N. Y	May 17
Erie, Pa	May 17
Cleveland, Ohio	Apr. 9
Sandusky, Ohio	Apr. 9
Toledo, Ohio	Apr. 9
Detroit, Mich	May 17
Upper Lakes:	
Alpena, Mich	June 6
Escanaba, Mich	June 18
Grand Haven, Mich	June 18
Mackinaw City, Mich	June 2
Marquette, Mich	May 25
Port Huron, Mich	June 19
Chicago, Ill	May 21
Milwaukee, Wis	June 5
Duluth, Minn	June 6
Upper Mississippi Valley:	
Saint Paul, Minn	May 16
La Crosse, Wis	May 16
Davenport, Iowa	Apr. 8
Des Moines, Iowa	May 16
Dubuque, Iowa	(³)
Keokuk, Iowa	May 16
Cairo, Ill	Apr. 8
Springfield, Ill	May 16
Saint Louis, Mo	Apr. 6
Missouri Valley:	
Lamar, Mo	Apr. 7
Leavenworth, Kans	Apr. 7
Omaha, Nebr	(³)
Valentine, Nebr	May 15
Huron, Dak	May 6
Sully, Fort, Dak	June 2
Yankton, Dak	May 16
Extreme Northwest:	
Moorhead, Minn	June 6
Saint Vincent, Minn	June 7
Bismarck, Dak	May 15
Buford, Fort, Dak	May 14
Totten, Fort, Dak	June 7
Northern Slope:	
Assinaboine, Fort, Mont	May 16
Benton, Fort, Mont	May 13
Custer, Fort, Mont	Apr. 29
Helena, Mont	May 7
Maginnis, Fort, Mont	May 14
Poplar River, Mont	May 15
Shaw, Fort, Mont	May 14
Deadwood, Dak	May 16
Cheyenne, Wyo	May 15
North Platte, Nebr	May 14
Middle Slope:	
Denver, Colo	May 15
Pike's Peak, Colo	(¹)
West Las Animas, Colo	Apr. 29
Concordia, Kans	Apr. 29
Dodge City, Kans	May 15
Elliott, Fort, Tex	Apr. 7
Southern Slope:	
Sill, Fort, Ind. T	(³)
Abilene, Tex	Apr. 6
Davis, Fort, Tex	Apr. 6
Stockton, Fort, Tex	Mar. 9
Stanton, Fort, N. Mex	Apr. 28

¹ Frost each month. ² No frost reported. ³ No reliable record.

APPENDIX 51.

Average movement of the wind at stations of the Signal Service, United States Army, for each month and the year.

[Computed from the commencement of observations at each to December, 1885, inclusive.]

Districts and stations.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
	Miles.	*Miles.*	*Miles.*	*Miles.*	*Miles.*	*Miles.*	*Miles.*	*Miles.*	*Miles.*	*Miles.*	*Miles.*	*Miles.*	*Miles.*
	9,213	8,479	9,329	7,218	6,138	4,671	4,540	4,254	5,330	7,124	8,479	8,967	83,961
	5,856	5,663	6,709	6,858	5,713	4,996	4,903	4,386	4,844	5,439	5,970	5,949	67,359
	7,689	7,251	8,575	7,409	6,642	5,825	5,564	5,450	5,988	6,765	7,522	7,675	83,602
	12,560	11,307	12,512	10,149	9,736	9,068	8,436	7,824	9,718	10,968	12,173	13,465	128,092
	5,962	5,672	6,853	6,459	5,470	4,602	4,477	4,258	4,837	5,470	5,916	6,014	66,180
	5,819	5,941	6,763	6,004	5,323	4,299	4,253	4,004	4,385	6,230	5,777	5,721	63,750
	5,706	5,524	6,478	5,945	5,182	4,369	3,906	3,445	3,642	4,512	5,163	5,522	59,336
	7,696	7,476	8,671	7,207	6,618	5,871	5,698	5,538	6,119	6,962	7,831	7,759	82,839
	7,663	7,259	8,762	7,968	7,135	6,527	6,238	5,686	5,959	6,868	7,018	7,612	84,367
	7,200	7,209	8,685	7,970	7,356	6,272	5,654	6,556	7,180	6,954	6,865	7,205	84,564
	10,275	9,698	11,308	9,919	8,924	7,905	7,464	8,099	8,869	9,489	9,960	10,165	112,811
	11,004	11,145	12,284	10,653	9,390	8,018	7,609	7,465	8,289	10,243	11,362	11,833	122,131
	11,518	10,310	12,480	10,503	9,314	8,737	8,278	8,606	9,266	11,117	12,040	12,875	125,693
	4,232	4,150	5,202	4,904	4,436	4,269	4,124	3,669	3,740	3,941	3,997	4,271	51,059
	4,704	4,774	6,290	5,695	4,756	4,222	3,991	3,581	3,755	4,014	4,414	4,646	55,478
	9,732	9,177	10,791	9,632	8,720	8,092	7,828	7,433	9,036	9,717	9,847	10,231	110,656
	9,205	8,927	10,364	9,620	8,624	7,424	6,816	6,958	7,609	8,704	9,278	9,217	98,615
	2,814	3,001	3,605	3,344	2,652	2,331	2,249	2,057	1,900	2,154	2,921	2,764	31,426
	5,687	5,634	6,894	6,228	5,692	5,255	4,963	4,775	4,763	5,317	5,449	5,693	67,057
	4,023	4,246	4,867	4,498	3,813	3,672	3,237	3,261	3,486	3,653	3,628	3,900	46,084
	10,995	10,704	12,064	11,177	10,202	9,728	9,811	9,264	9,027	9,677	9,097	10,445	121,963
	11,464	10,899	11,893	11,899	10,565	9,637	8,999	9,283	10,613	11,169	11,846	11,671	127,909
	10,054	9,436	10,892	9,760	9,305	9,109	8,671	8,946	9,487	10,148	9,005	10,124	117,715
	6,623	6,673	8,023	7,696	7,371	7,746	7,666	6,872	6,696	6,339	6,031	6,539	84,470
	5,375	5,266	6,676	6,211	5,808	5,038	4,870	4,216	4,241	4,567	4,793	5,406	62,494
	5,544	5,512	6,522	6,160	6,898	5,847	5,566	5,319	5,685	5,689	5,206	5,279	69,844
	2,702	2,940	3,578	3,176	2,931	2,746	2,420	2,290	2,510	2,690	2,590	2,609	33,146
	4,821	4,855	5,836	5,681	5,513	4,554	4,307	4,069	4,197	4,593	4,637	4,719	58,809
	4,898	4,650	5,771	5,426	4,967	4,692	4,765	4,560	4,542	5,138	4,537	4,495	58,842
	6,844	6,364	7,821	7,225	7,118	6,373	5,957	6,336	5,943	6,996	5,632	6,248	79,235
	8,150	7,103	8,297	7,547	6,962	5,629	5,525	5,402	5,764	8,671	8,024	8,429	85,571
	5,710	4,634	4,974	4,745	4,249	3,632	3,366	3,498	3,938	5,476	4,767	4,658	52,918

[1]Station closed December 31, 1885.

[2]Station closed October 31, 1885.

Average movement of the wind at stations of the Signal Service, United States Army, for each month and the year—Continued.

Districts and stations.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
	Miles.	*Miles.*	*Miles.*	*Miles.*	*Miles.*	*Miles.*	*Miles.*	*Miles.*	*Miles.*	*Miles.*	*Miles.*	*Miles.*	*Miles.*
	7,987	7,633	8,219	6,720	6,012	5,368	5,870	5,275	5,762	6,588	6,800	7,504	79,268
	5,619	5,682	6,206	6,331	6,206	5,604	4,870	4,928	4,776	5,568	5,284	5,504	66,658
	4,653	4,560	5,096	4,903	4,692	4,040	3,986	3,839	4,160	4,531	4,424	4,490	58,623
	4,159	4,226	4,799	4,216	3,635	3,346	3,117	2,882	3,249	3,569	3,668	3,944	46,045
	4,621	4,419	5,023	4,604	3,865	3,224	3,047	2,838	2,870	3,559	4,352	4,677	47,697
	5,918	5,808	6,275	5,937	5,111	4,271	4,236	4,076	5,047	5,429	5,674	6,040	64,242
	3,920	4,088	4,700	4,637	3,901	3,230	3,106	2,753	2,924	3,142	3,499	3,756	43,520
	4,542	4,310	4,762	4,585	3,649	2,787	2,701	2,666	2,903	3,329	3,303	4,340	43,546
	3,973	4,272	5,024	4,744	3,744	3,000	3,121	2,992	2,834	3,585	3,672	4,137	44,907
	7,941	7,369	7,572	7,962	7,345	6,036	5,704	5,348	6,585	7,123	7,835	7,880	85,906
	10,490	10,102	10,621	11,710	9,738	8,152	8,009	7,100	8,083	8,771	10,106	10,376	112,744
	6,906	7,674	7,641	7,452	6,454	5,108	5,032	5,183	5,636	6,360	6,502	7,210	76,972
	3,545	3,800	3,812	4,026	3,846	3,769	3,844	2,895	3,124	3,354	3,747	3,969	80,607
	5,396	5,908	6,287	6,614	5,744	5,167	5,496	3,969	3,489	3,924	4,920	5,414	62,251
	5,627	5,180	5,639	6,618	6,861	6,945	7,723	5,437	4,820	4,395	4,332	4,288	68,202
:													
	4,682	5,134	5,648	5,130	4,025	3,569	3,470	3,282	3,239	3,584	3,978	4,728	50,490
	4,566	4,626	5,532	5,073	4,291	3,778	3,444	3,159	3,209	3,265	3,780	4,330	49,083
	4,567	4,056	4,995	4,883	3,929	3,491	3,299	3,095	3,243	3,600	4,211	4,420	47,846
	3,634	3,582	4,197	3,948	3,317	2,934	2,696	2,525	2,649	2,963	3,400	3,673	40,563
	5,789	5,752	6,637	5,986	5,206	4,377	4,268	4,084	4,812	4,871	5,394	5,797	63,140
	6,802	5,640	7,091	6,949	5,253	4,203	3,060	3,730	3,763	4,257	5,758	6,864	64,164
	4,727	4,341	5,472	5,040	4,264	3,670	9,215	3,354	3,351	3,703	4,171	4,698	49,880
	6,672	6,868	7,663	6,661	5,912	5,419	4,939	4,506	4,742	5,880	6,008	6,432	71,107
	6,201	6,150	6,949	6,164	5,238	4,745	4,211	3,805	4,180	4,679	5,552	6,128	63,894
	5,128	4,652	5,578	4,723	4,121	3,993	3,792	3,809	3,518	3,941	4,804	5,212	52,868
	8,823	7,382	7,917	6,832	5,929	5,528	6,485	5,029	5,932	6,858	7,969	9,175	82,163
	8,239	7,506	7,770	6,424	5,728	4,788	4,772	4,555	5,487	6,545	7,699	8,264	77,673
	8,754	7,929	8,756	7,619	7,268	6,079	5,757	5,284	6,066	6,732	7,500	8,143	83,442
	8,820	7,806	8,811	7,722	6,630	5,991	5,685	5,871	6,832	7,006	8,956	9,664	88,745
	8,162	6,938	7,913	6,722	6,242	5,698	5,457	5,191	6,270	7,238	8,129	8,844	84,018
	9,725	9,808	10,905	10,184	9,315	8,646	7,664	7,706	8,349	9,588	10,373	10,234	111,577
	7,054	6,109	7,228	6,819	6,312	5,448	6,066	4,995	5,305	6,224	6,699	6,891	74,832
	6,454	5,910	6,807	6,282	5,997	5,041	4,935	4,713	5,079	5,936	6,200	6,577	70,003
Upper Lakes:													
Alpena, Mich	6,945	6,765	7,383	6,786	6,281	5,726	5,642	5,404	6,107	6,891	6,879	7,043	70,210
Escanaba, Mich	7,833	6,559	7,710	7,229	6,719	6,131	6,053	5,812	6,992	7,788	7,002	7,166	82,515
Grand Haven, Mich	8,869	8,182	8,858	8,503	7,656	6,446	6,284	6,090	7,161	8,679	8,805	9,123	93,501
Mackinaw City, Mich	6,328	6,432	6,978	6,854	6,551	5,691	6,528	6,193	6,676	7,900	8,408	8,958	85,186

	6,442	6,962	6,690	5,968	5,420	4,975	5,076	5,297	6,258	6,908	6,780	7,258	73,736
	7,783	7,026	7,894	7,596	7,352	5,988	5,710	5,429	6,049	6,961	7,479	7,811	83,907
	6,741	6,025	7,110	6,777	6,812	5,491	5,153	5,201	5,615	6,236	6,141	6,455	73,272
	8,939	8,205	9,504	8,591	7,959	6,786	6,344	6,718	7,240	8,409	8,891	9,122	96,920
	4,877	5,102	5,814	6,293	5,235	4,500	4,951	4,921	5,470	5,981	5,388	6,255	63,845
	5,606	5,385	6,472	6,934	6,912	5,866	5,267	5,384	5,914	6,838	5,628	5,419	71,212
	5,236	5,194	6,258	6,290	5,843	5,090	4,669	4,617	5,092	5,818	5,428	5,231	64,751
	6,835	6,087	7,654	7,698	6,718	5,449	4,992	4,824	5,522	5,922	6,141	6,072	72,529
	4,718	4,878	5,942	5,821	4,740	3,998	3,683	3,452	4,008	4,303	4,583	4,584	54,679
	3,626	3,676	4,783	5,003	4,390	3,786	3,230	3,145	3,828	3,809	3,783	3,532	46,190
	6,049	6,670	7,062	7,271	6,439	5,254	4,640	4,715	5,394	5,800	5,967	5,705	69,988
	5,845	6,881	7,451	6,587	3,565	4,697	3,914	3,727	4,164	4,905	5,606	5,864	64,796
	6,980	6,813	7,925	7,425	6,333	5,128	4,390	4,861	5,501	5,982	6,809	6,949	75,122
	7,683	7,087	8,842	7,964	7,801	6,462	5,769	5,624	6,268	7,140	7,769	7,685	86,714
	5,339	5,132	6,681	6,501	5,474	4,943	4,070	3,946	4,646	4,854	5,159	5,000	61,426
	6,805	6,392	7,876	7,636	6,906	5,764	5,237	5,106	5,688	6,461	6,638	6,659	77,507
	4,579	4,267	6,066	7,099	7,243	6,099	5,071	6,255	6,022	5,696	5,130	4,594	66,436
	7,446	6,592	8,168	8,723	8,289	6,580	6,763	6,586	7,316	7,231	6,862	6,764	85,195
	6,522	6,271	9,020	9,128	8,936	8,363	8,197	8,167	7,008	7,891	7,384	6,498	92,725
	6,343	5,222	7,750	6,446	7,820	6,566	5,100	5,228	5,538	6,780	6,350	5,983	78,168
	7,924	7,163	8,749	8,268	8,626	7,249	6,826	7,262	7,680	7,901	7,820	8,149	90,788
	7,157	6,893	7,292	6,827	7,234	5,945	5,784	5,415	6,038	6,716	7,054	7,154	78,503
	5,769	5,720	6,954	8,004	7,031	6,550	6,609	6,213	6,306	6,904	6,087	5,816	78,642
	5,198	5,164	6,339	7,542	7,124	6,241	6,549	6,521	6,157	6,613	5,780	5,294	74,680
	10,450	7,967	8,741	8,309	6,979	7,901	7,469	8,138	8,524	10,628	8,302	9,114	102,516
ont	8,276	7,721	7,547	7,238	7,094	7,050	7,516	6,467	6,701	7,869	6,418	8,517	91,625
	5,252	5,294	5,032	5,516	5,270	4,770	4,866	4,850	4,936	5,155	5,366	5,143	54,189
	5,307	4,961	5,941	6,038	5,890	5,058	5,653	4,957	4,751	5,040	4,545	4,966	64,728
	3,649	3,410	4,726	4,818	4,981	4,651	4,646	4,036	4,021	4,124	3,734	3,626	51,275
	11,578	8,938	8,153	7,497	7,518	7,069	7,327	6,844	6,769	8,561	8,939	9,744	97,946
	3,095	2,952	5,256	6,964	5,810	5,323	5,997	3,803	4,883	5,690	3,156	3,945	58,398
	8,549	8,248	7,614	6,576	6,369	5,527	5,374	4,674	5,682	7,184	7,775	8,011	81,464
	2,945	2,465	2,776	2,946	3,111	3,324	3,101	3,178	2,946	2,994	2,498	2,324	34,693
	9,718	8,452	9,247	8,440	7,783	6,748	6,627	6,043	6,479	7,398	7,878	8,444	93,225
	7,005	6,464	8,718	9,460	9,902	8,871	8,533	8,096	8,126	8,204	6,953	6,443	97,154
	4,967	4,307	5,447	5,246	5,058	4,676	4,610	4,224	4,047	4,479	4,440	4,527	55,928
	18,186	16,643	18,416	15,818	15,799	13,727	9,468	9,165	11,530	15,656	14,423	16,756	178,392
do	5,214	5,485	6,842	6,106	6,037	6,600	5,493	5,706	5,941	5,845	4,465	5,018	70,253
	8,119	7,742	10,231	10,764	10,575	9,555	9,283	8,246	8,935	8,841	7,434	7,612	109,607
	6,190	7,665	9,451	10,298	9,834	5,644	7,354	7,174	7,134	6,035	7,040	7,601	98,144
	7,632	7,741	9,297	9,919	9,312	8,624	7,287	6,216	7,097	7,639	6,858	7,379	94,192
	6,206	6,385	7,231	7,969	8,021	7,253	6,565	5,527	5,607	5,986	5,699	6,442	80,590
	4,398	4,160	5,020	5,209	4,371	3,984	3,693	3,482	3,265	3,693	4,009	4,842	50,586
	5,166	5,613	7,017	7,700	8,895	8,932	7,977	6,795	7,082	6,504	4,789	5,129	81,890

[1] Station closed November 30, 1885.

[2] Station closed September 15, 1885.

stations of the Signal Service, United States Army, for each month and the year—Continued.

		February.	March.	April.	May.	June.	July.	August.	September.	Annual.
	Miles.	*Miles.*	*Miles.*	*Miles.*	*Miles.*	*Miles.*	*Miles.*	*Miles.*	*Miles.*	*Miles.*
Santa Fé, N. Mex	5,240	4,557	5,928	6,258	6,232	5,342	4,949	4,579	4,320	60,871
El Paso, Tex	3,494	3,943	4,673	4,530	4,265	3,703	3,876	2,643	2,596	42,960
Apache, Fort, Ariz	3,627	3,919	4,861	5,772	5,676	5,416	4,463	3,905	4,159	55,143
Grant, Fort, Ariz	4,778	5,042	5,461	6,219	5,751	5,645	4,918	4,525	5,085	62,628
Prescott, Ariz	3,462	4,132	5,101	6,244	5,801	5,447	4,460	3,647	3,908	54,466
Yuma, Ariz	4,221	4,425	4,847	4,623	4,290	3,749	4,507	4,153	2,978	47,642
Middle Plateau:										
Winnemucca, Nev	6,546	6,251	6,897	6,290	6,236	6,354	5,850	6,239	5,940	72,805
	2,907	2,903	4,223	4,463	4,641	4,391	4,366	4,180	3,915	45,680
	3,016	3,222	3,963	4,199	4,223	3,487	3,279	2,787	2,729	39,473
	3,225	1,904	2,352	2,290	2,173	1,660	2,191	1,866	1,694	22,695
	3,314	3,880	4,302	4,470	4,234	3,790	3,840	3,562	3,576	46,224
	2,840	3,174	3,406	4,253	4,153	3,921	3,962	3,204	3,146	39,223
	10,968	8,974	5,750	5,996	6,214	6,510	4,569	4,873	6,571	88,040
	2,902	2,667	2,756	2,759	2,753	2,502	2,476	2,014	2,283	31,618
	12,298	11,127	8,729	7,076	7,425	5,156	4,428	5,637	7,995	104,001
	4,238	3,425	3,084	3,356	3,643	3,395	3,440	3,044	3,066	40,809
	2,069	1,960	2,235	2,457	2,512	2,576	2,690	2,257	1,920	28,388
	18,175	14,266	12,384	13,302	12,804	11,748	15,148	16,141	12,675	178,247
	5,376	5,448	6,224	5,856	5,864	5,405	4,526	3,687	4,416	60,184
	4,631	4,591	5,419	5,419	5,612	5,656	5,270	4,662	4,116	57,729
	5,185	4,924	6,544	7,185	8,366	9,056	9,485	8,949	7,168	81,885
	4,270	4,048	4,094	3,996	3,932	3,719	3,559	3,363	3,279	45,060
	3,625	4,108	4,768	4,777	4,326	4,563	4,714	4,469	4,267	51,781
	10,381	8,897	9,841	8,982	7,443	7,692	5,428	9,362	9,616	107,289
	7,108	6,691	6,816	6,375	6,436	6,179	5,484	4,546	5,324	79,912
	9,979	9,883	9,871	9,275	7,994	7,480	7,248	6,465	9,396	105,499
ring Sea	11,548	11,029	10,716	8,917	8,940	8,061	7,497	7,806	7,331	88,199

[1] Station closed December 31, 1883. [2] Station closed November 30, 1883.

APPENDIX 52.

Average cloudiness, scale of 0 to 10, at stations of the Signal Service, United States Army, for each month and the year; computed from the commencement of observations at each to December, 1885, inclusive, from the tri-daily telegraphic observations.

[The monthly average is obtained by dividing the sums of the amount of cloudiness recorded daily by the number of observations taken.]

Districts and stations.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
New England:													
Eastport, Me	5.6	5.4	6.1	6.0	5.8	5.8	5.6	5.0	5.2	5.6	6.3	6.1	5.7
Portland, Me	4.9	4.7	5.5	5.4	5.3	4.9	4.7	4.4	4.6	5.1	5.1	5.3	5.0
Mount Washington, N. H	6.2	5.9	6.3	6.1	5.7	5.8	5.9	5.6	5.6	5.8	6.1	5.9	5.9
Boston, Mass	5.4	4.8	5.5	5.5	5.2	4.9	5.0	4.6	4.6	4.9	5.2	5.5	5.1
Block Island, R. I	5.3	4.7	5.0	4.4	4.9	3.6	4.0	4.4	4.4	4.7	5.2	5.0	4.7
New Haven, Conn	5.4	4.9	5.4	5.4	5.1	4.7	4.8	4.8	4.6	4.6	5.0	5.5	5.0
New London, Conn	5.1	4.6	5.1	5.1	4.6	4.4	4.6	4.6	4.5	4.5	4.9	5.1	4.7
Middle Atlantic States:													
Albany, N. Y	5.9	5.6	6.0	5.8	5.2	4.8	4.9	5.1	4.9	5.7	6.8	7.1	5.6
New York City	5.7	5.1	5.4	5.4	5.0	4.7	4.8	4.9	4.5	4.7	5.2	5.6	5.1
Philadelphia, Pa	5.5	5.2	5.5	5.3	4.6	4.7	4.6	4.7	4.4	4.5	5.0	5.9	5.0
Atlantic City, N. J	5.9	5.4	5.7	5.4	4.9	4.5	4.7	4.8	4.6	4.5	5.2	5.6	5.1
Barnegat City, N. J.[1]	5.7	5.4	5.6	5.4	4.9	4.7	4.7	4.7	4.7	4.6	5.1	5.6	5.1
Cape May, N. J.[2]	5.1	4.6	5.0	4.6	4.1	4.1	4.8	4.7	4.0	3.9	5.1	5.1	4.6
Sandy Hook, N. J	5.5	5.2	5.4	5.5	4.7	4.4	4.6	4.5	4.7	4.5	4.9	5.6	5.0
Baltimore, Md	5.6	5.3	5.4	5.3	4.9	4.9	4.9	5.0	4.6	4.5	4.9	5.3	5.1
Washington City	6.0	5.6	5.5	5.4	4.9	4.9	4.6	4.9	4.6	4.7	5.1	5.7	5.2
Cape Henry, Va	5.9	5.1	5.1	5.1	4.4	4.4	4.7	5.1	4.5	4.2	5.0	5.3	4.9
Chincoteague, Va	6.0	5.1	5.0	5.0	4.6	4.6	4.6	4.7	3.8	4.4	4.6	5.1	4.7
Lynchburg, Va	5.2	4.8	4.8	4.8	4.4	4.8	4.6	5.0	4.2	3.9	4.5	4.7	4.6
Norfolk, Va	5.4	5.3	5.1	5.1	4.8	4.8	4.8	5.1	4.7	4.2	4.8	4.9	4.9
South Atlantic States:													
Charlotte, N. C	6.4	5.2	5.1	5.2	5.0	5.1	5.0	5.1	4.7	4.6	4.6	5.1	5.1
Hatteras, N. C	5.9	4.9	4.9	4.8	4.4	4.7	4.3	5.1	4.4	4.5	5.1	5.1	4.8
Kitty Hawk, N. C	5.4	4.9	4.9	4.9	4.3	4.3	4.5	5.2	4.5	4.4	4.9	5.1	4.8
Macon, Fort, N. C	6.2	5.0	4.9	5.2	4.6	5.3	4.5	5.3	4.0	4.1	4.6	5.0	4.9
Smithville, N. C	5.4	4.8	4.5	4.5	3.8	4.4	4.5	4.9	4.6	4.2	4.5	4.7	4.6
Wilmington, N. C	5.4	5.2	4.9	4.6	4.9	4.9	5.0	5.4	5.0	4.1	4.9	5.0	4.9
Charleston, S. C	5.0	4.6	4.2	4.2	4.1	4.8	4.7	5.0	4.8	3.7	4.3	4.6	4.5
Augusta, Ga	5.1	4.8	4.6	4.5	4.1	4.7	4.5	5.0	4.6	3.8	4.7	4.8	4.6
Savannah, Ga	5.1	4.8	4.3	4.4	4.3	4.9	4.7	5.1	4.9	4.1	4.6	4.6	4.6
Jacksonville, Fla	4.9	4.6	3.9	4.1	4.1	4.7	4.1	4.4	4.7	4.3	4.6	4.5	4.4
Florida Peninsula:													
Cedar Keys, Fla	4.5	3.6	3.7	3.5	3.8	4.8	4.6	4.9	3.7	3.3	3.8	4.0	4.0
Key West, Fla	4.2	3.5	2.9	3.1	4.3	4.9	4.9	5.0	5.2	4.6	4.0	4.1	4.2
Sanford, Fla	5.4	4.2	4.2	3.5	4.2	5.5	4.0	4.3	5.0	4.5	4.5	3.8	4.2
Eastern Gulf States:													
Atlanta, Ga	6.1	5.3	4.9	4.8	4.6	5.1	4.6	5.2	4.3	4.4	4.7	5.2	5.0
Pensacola, Fla	5.8	4.8	4.3	4.7	4.4	4.5	4.7	4.9	4.2	4.2	4.7	5.0	4.7
Mobile, Ala	5.4	5.0	4.7	4.8	4.3	4.8	4.9	4.8	4.5	4.0	4.5	5.0	4.7
Montgomery, Ala	6.2	5.4	4.7	4.8	4.4	5.0	4.9	4.9	4.5	4.3	4.8	5.5	4.9
Vicksburg, Miss	5.8	5.4	4.9	4.5	4.3	4.0	4.2	4.0	4.5	3.8	4.7	5.3	4.6
New Orleans, La	5.3	5.0	4.9	5.0	4.6	4.5	4.9	4.7	4.6	4.1	4.8	5.4	4.8
Western Gulf States:													
Shreveport, La	6.0	5.5	5.2	5.0	4.7	4.5	4.1	3.6	3.8	3.9	4.6	5.3	4.7
Fort Smith, Ark	4.9	5.7	5.1	5.2	4.7	4.3	4.1	4.1	3.9	4.4	4.4	5.0	4.7
Little Rock, Ark	5.6	5.6	5.2	4.6	4.7	3.8	3.9	3.5	3.7	4.0	4.6	5.0	4.5
Galveston, Tex	5.5	5.4	5.2	4.9	4.8	4.0	3.9	4.1	4.1	3.7	4.6	5.2	4.6
Indianola, Tex	5.4	5.6	5.6	5.0	5.0	3.9	3.7	3.7	3.9	3.7	4.6	5.4	4.6
Palestine, Tex	5.6	5.5	5.3	5.6	5.0	4.2	4.1	3.6	4.0	4.1	4.6	5.1	4.8
San Antonio, Tex	5.2	5.3	5.0	4.7	5.3	4.3	4.4	4.0	4.0	4.1	4.7	5.0	4.4
Rio Grande Valley:													
Brownsville, Tex	5.8	5.7	5.8	5.4	4.9	3.8	3.7	4.5	4.7	4.3	5.4	5.6	4.9
Rio Grande City, Tex	5.4	4.6	5.2	4.2	4.3	3.4	2.9	4.1	3.8	4.2	4.3	4.6	4.1

[1] Station closed December 31, 1885.

[2] Station closed October 31, 1885.

Average cloudiness, scale of 0 to 10, at stations of the Signal Service, &c.—Continued.

Districts and stations.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
Ohio Valley and Tennessee:													
Chattanooga, Tenn	6.2	5.7	5.2	5.0	4.4	4.4	4.2	4.8	4.4	4.7	4.7	5.7	5.0
Knoxville, Tenn	6.3	5.7	5.2	5.0	4.4	5.0	4.6	4.6	4.1	4.0	5.3	5.4	5.0
Memphis, Tenn	5.9	5.8	5.1	5.0	4.7	4.3	4.3	4.0	4.0	4.0	5.2	5.7	4.8
Nashville, Tenn	6.5	6.1	5.7	5.5	5.0	5.2	4.9	4.3	4.5	4.2	5.4	6.3	5.4
Louisville, Ky	6.2	5.9	5.9	5.4	4.8	5.3	4.6	3.9	4.4	4.1	5.6	6.2	5.2
Greencastle, Ind	5.7	4.7	6.0	5.9	4.9	4.7	3.7	4.0	4.5	4.1	5.4	6.8	5.2
Indianapolis, Ind	6.2	5.8	6.1	5.6	4.9	5.3	4.6	4.1	4.0	4.6	5.8	6.4	5.3
Cincinnati, Ohio	6.3	6.0	5.9	5.3	4.5	5.1	4.4	4.2	4.2	4.4	5.8	6.4	5.2
Columbus, Ohio	6.8	6.4	6.4	5.5	4.6	5.2	4.4	4.2	4.3	4.9	5.7	7.3	5.5
Pittsburg, Pa	7.0	6.6	6.6	5.6	5.0	4.8	4.9	4.5	5.0	5.4	6.6	7.2	5.8
Lower Lakes:													
Buffalo, N. Y	7.7	6.5	6.3	5.6	5.2	4.9	4.7	4.5	5.0	6.0	7.5	8.2	6.0
Oswego, N. Y	8.0	7.3	6.9	5.7	5.1	4.9	4.8	4.7	5.2	6.4	8.1	8.7	6.3
Rochester, N. Y	7.9	6.9	6.8	5.6	4.9	4.7	4.6	4.5	4.9	6.0	7.8	8.4	6.9
Erie, Pa	7.6	6.6	6.5	5.5	4.6	4.5	4.3	4.4	4.9	6.1	7.8	8.3	5.9
Cleveland, Ohio	7.3	6.4	6.5	5.4	4.0	4.5	4.4	4.2	4.9	5.6	7.3	7.6	5.7
Sandusky, Ohio	6.8	6.3	6.2	5.5	4.7	4.6	4.2	4.2	4.4	5.4	6.6	7.5	5.5
Toledo, Ohio	6.9	6.3	6.3	5.7	5.0	5.0	4.6	4.3	4.5	5.5	6.6	7.3	5.7
Detroit, Mich	6.9	6.0	6.2	5.4	4.9	4.9	4.3	4.1	4.3	5.1	6.4	7.0	5.5
Upper Lakes:													
Alpena, Mich	7.1	6.2	5.8	4.8	4.8	4.6	4.2	4.2	5.2	6.1	7.3	7.8	5.7
Escanaba, Mich	6.2	5.8	5.5	5.2	5.2	4.9	4.5	4.8	5.2	6.4	7.2	6.9	5.7
Grand Haven, Mich	8.0	6.5	6.1	5.1	4.4	4.5	3.8	3.7	4.3	5.5	7.4	8.1	5.6
Mackinaw City, Mich	7.0	6.3	4.9	5.3	5.3	4.8	4.8	4.5	4.8	6.4	7.9	8.7	5.9
Marquette, Mich	6.7	6.1	5.3	5.2	4.7	4.7	4.4	4.5	5.7	6.6	7.3	7.4	5.7
Port Huron, Mich	7.0	6.4	6.3	5.5	5.1	4.8	4.5	4.7	4.8	6.1	6.9	7.9	5.8
Chicago, Ill	5.6	5.5	5.8	5.3	4.6	5.1	4.0	3.8	4.3	5.2	5.9	6.0	5.1
Milwaukee, Wis	5.9	5.8	6.0	5.6	5.1	5.2	4.5	4.5	4.9	5.5	6.4	6.3	5.5
Duluth, Minn	4.9	5.4	5.0	5.2	5.1	5.3	4.7	4.9	5.3	6.1	6.3	5.8	5.4
Upper Mississippi Valley:													
Saint Paul, Minn	4.8	4.8	5.2	5.3	5.2	5.0	4.3	4.6	4.8	5.1	5.8	5.1	5.0
La Crosse, Wis	4.8	4.8	5.2	4.7	4.9	4.8	4.3	4.3	4.4	5.0	5.9	5.4	4.9
Davenport, Iowa	5.4	5.4	5.6	5.6	5.1	5.2	4.5	4.3	4.5	5.0	5.8	6.1	5.2
Des Moines, Iowa	4.8	5.1	5.3	5.8	5.7	5.7	4.8	4.6	4.6	4.9	4.8	6.0	5.2
Dubuque, Iowa	4.7	5.3	5.9	5.4	5.4	5.6	4.6	4.4	4.9	5.5	6.1	6.2	5.4
Keokuk, Iowa	5.5	4.8	5.4	5.2	5.2	5.3	4.4	3.9	3.9	4.5	5.4	5.7	4.9
Cairo, Ill	6.0	5.6	5.3	5.3	4.9	5.0	4.4	3.8	4.2	4.3	5.6	6.2	5.1
Springfield, Ill	5.5	5.0	5.4	5.4	4.8	5.5	4.0	3.7	3.9	4.5	5.0	6.2	4.9
Saint Louis, Mo	5.4	5.3	5.4	5.2	5.0	5.1	4.4	3.7	3.7	4.0	5.3	5.9	4.9
Missouri Valley:													
Leavenworth, Kans	4.9	4.9	5.0	5.3	5.4	4.6	4.3	3.7	4.0	4.1	4.6	5.3	4.7
Omaha, Nebr	4.9	4.8	5.3	5.5	5.7	5.0	4.5	4.2	4.0	4.2	4.6	5.3	4.8
Bennett, Fort, Dak.[1]	4.6	5.0	5.5	5.6	5.4	4.8	4.7	4.2	4.0	4.7	4.6	5.1	4.9
Huron, Dak	4.2	4.6	5.6	5.3	4.9	4.4	4.4	4.1	4.0	5.1	4.5	4.7	4.7
Yankton, Dak	4.1	4.9	5.1	4.9	5.4	4.6	4.2	3.9	3.8	4.3	4.3	4.8	4.5
Extreme Northwest:													
Moorhead, Minn	4.2	4.8	5.4	4.9	5.2	5.1	4.8	4.3	4.5	5.5	5.8	5.2	5.0
Saint Vincent, Minn	4.0	4.4	4.8	4.7	4.5	4.6	4.7	4.1	4.4	5.7	5.9	4.3	4.7
Bismarck, Dak	4.3	4.9	5.6	5.6	5.5	4.8	4.1	3.5	3.8	4.7	5.1	5.3	4.8
Buford, Fort, Dak	5.2	4.6	5.3	5.0	4.8	5.0	4.4	3.7	4.1	5.4	5.5	5.1	5.0
Totten, Fort, Dak	2.8	3.4	6.2	6.1	4.9	5.0	4.8	4.2	4.5	4.4	5.4	5.2	4.7
Northern Slope:													
Assinaboine, Fort, Mont	5.6	5.2	4.7	4.3	4.3	3.9	3.6	3.2	3.7	4.6	4.9	5.0	4.2
Benton, Fort, Mont	6.0	5.6	4.7	4.9	4.7	4.5	3.4	2.8	4.2	5.3	5.3	5.8	4.8
Custer, Fort, Mont	5.4	5.7	4.9	5.3	5.3	4.7	4.0	3.0	3.6	4.7	4.6	5.8	4.8
Helena, Mont	6.4	5.6	4.2	4.6	4.9	4.4	3.4	2.8	3.5	4.3	4.8	5.0	4.6
Maginnis, Fort, Mont	6.7	6.0	5.3	5.2	5.2	5.0	4.0	3.3	4.4	4.8	5.1	5.5	5.1
Poplar River, Mont	4.4	4.4	4.7	4.0	3.2	3.1	3.4	2.9	3.1	4.1	4.4	4.8	4.6
Shaw, Fort, Mont	5.5	4.9	4.1	4.4	4 5	4.4	3.4	3.1	3.8	4.5	4.6	4.8	4.3
Deadwood, Dak	4.2	4.7	4.8	5.2	5.2	4.7	3.4	3.1	3.7	3.8	4.0	4.5	4.2
Cheyenne, Wyo	3.4	3.4	4.2	4.9	5.2	3.9	3.9	3.7	3.2	3.7	3.6	3.8	3.9
North Platte, Nebr	4.0	4.3	5.0	5.0	5.6	4.5	4.1	3.9	3.7	4.1	4.1	4.6	4.4
Middle Slope:													
Denver, Colo	3.2	3.5	4.0	4.9	5.0	3.7	4.1	4.2	3.1	3.4	3.3	3.4	3.8
Pike's Peak, Colo	3.7	4.2	4.5	4.8	4.7	3.8	4.8	4.7	3.6	3.6	3.4	3.7	4.1
West Las Animas, Colo	3.6	3.4	3.5	4.7	5.4	4.0	4.4	4.0	3.0	3.3	3.0	4.2	4.0
Dodge City, Kans	4.0	4.0	4.0	4.0	4.9	3.6	4.1	3.4	3.0	3.2	3.7	4.1	3.8
Elliott, Fort, Tex	3.2	3.2	3.5	3.5	4.5	3.6	3.7	3.4	3.1	3.4	3.0	3.4	3.5
Southern Slope:													
Sill, Fort, Ind. T	4.6	4.6	4.1	3.6	4.6	3.7	3.5	3.2	3.6	3.5	3.9	4.6	4.0
Concho, Fort, Tex.[2]	4.0	4.1	3.8	3.3	4.2	3.6	3.4	3.7	4.3	4.4	3.9	3.9	3.7
Davis, Fort, Tex	3.4	3.2	3.5	2.7	2.8	3.1	3.5	3.6	3.4	3.3	3.2	3.1	3.2
Stockton, Fort, Tex	3.1	3.4	3.2	2.8	3.2	2.9	3.0	3.0	2.8	2.8	2.9	3.3	3.1
Southern Plateau:													
Santa Fé, N. Mex	3.4	3.8	3.8	4.1	4.0	3.4	5.0	5.0	3.0	2.5	3.1	3.3	3.7
El Paso, Tex	3.3	3.2	3.1	2.7	2.6	3.2	3.7	3.6	2.9	2.9	3.2	3.3	3.1
Apache, Fort, Ariz	3.4	3.7	3.6	3.0	1.9	2.1	4.8	4.9	2.2	2.0	2.3	3.0	3.1

[1] Station closed November 30, 1885.
[2] Station closed September 15, 1885.

Average cloudiness, scale of 0 *to* 10, *at stations of the Signal Service, &c.*—Continued.

Districts and stations.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
Southern Plateau—Cont'd:													
Grant, Fort, Ariz	3.3	3.6	3.5	2.2	2.0	2.2	4.9	4.7	2.0	1.6	2.2	3.0	3.0
Prescott, Ariz	2.8	2.7	3.2	2.7	1.8	1.5	3.1	3.4	1.7	1.6	1.8	2.7	2.4
Thomas, Fort, Ariz	3.4	3.6	3.6	2.2	1.8	2.2	3.8	4.1	2.2	2.7	2.4	2.8	2.9
Yuma, Ariz	2.4	2.2	2.4	1.7	1.1	1.0	1.6	2.3	1.0	1.3	1.8	2.2	1.7
Middle Plateau:													
Winnemucca, Nev	4.5	4.8	3.9	4.4	4.2	3.2	1.6	1.4	1.9	2.5	3.8	4.3	3.4
Salt Lake City, Utah	5.3	5.4	5.1	5.3	4.6	3.2	2.6	3.1	2.7	3.9	4.6	5.6	4.3
Northern Plateau:													
Boisé City, Idaho	5.7	6.2	4.9	4.8	4.8	4.1	2.5	2.0	3.0	4.3	4.8	6.0	4.5
Lewiston, Idaho[1]	6.7	5.8	4.4	4.4	4.4	4.5	2.7	2.0	3.1	4.6	5.6	6.6	4.6
Dayton, Wash[2]	6.4	5.8	4.4	4.7	4.6	4.6	2.8	1.9	3.5	4.8	5.5	7.0	4.7
Spokane Falls, Wash	6.2	6.1	4.4	4.4	4.8	5.1	3.6	2.0	3.8	5.3	6.2	4.6	4.6
North Pacific Coast:													
Canby, Fort, Wash	5.2	5.0	4.9	4.9	6.4	7.2	6.4	4.1	5.0	5.0	6.9	6.6	5.6
Olympia, Wash	7.9	7.2	6.3	6.3	6.1	6.0	4.6	4.3	5.2	6.4	7.5	7.7	6.3
Tatoosh Island, Wash	7.2	6.8	6.0	5.6	6.0	7.1	5.6	4.0	7.0	5.7	7.8	7.2	6.4
Portland, Oreg	7.1	7.3	6.8	6.3	6.5	5.8	3.9	3.7	4.3	5.7	6.7	7.2	6.0
Roseburg, Oreg	7.0	6.8	5.5	5.7	5.1	4.9	3.0	2.1	3.2	5.3	6.2	6.7	5.1
Middle Pacific Coast:													
Cape Mendocino, Cal	5.3	4.1	4.6	5.6	4.2	3.9	2.5	1.5	2.4	3.8	4.8	4.8	4.1
Red Bluff, Cal	4.4	4.4	3.7	4.1	3.3	1.8	1.0	0.5	1.0	2.1	3.3	4.4	2.8
Sacramento, Cal	4.3	4.1	3.6	3.6	2.5	1.4	0.5	0.4	0.9	1.9	3.0	3.1	2.5
San Francisco, Cal	4.8	4.7	4.7	4.2	3.8	4.1	4.7	4.3	3.4	3.3	3.8	4.4	4.1
South Pacific Coast:													
Los Angeles, Cal	3.1	3.8	4.4	4.7	4.3	4.3	2.9	2.6	2.3	2.5	2.5	3.2	3.4
San Diego, Cal	3.9	4.3	4.8	4.5	5.3	5.0	4.6	4.0	3.5	3.7	3.5	3.8	4.2
Alaska Stations:													
Saint Michael's, Fort	6.1	4.3	5.6	6.8	7.3	7.4	7.8	8.2	8.2	7.7	6.3	5.3	6.7
Sitka	7.2	6.2	6.1	6.3	7.1	6.9	8.0	6.5	7.0	7.0	7.6	6.7	7.0
Unalashka	8.6	8.6	7.9	8.5	8.2	8.6	7.7	7.7	8.4	8.5	8.4	8.0	8.0
Behring's Island, Behring Sea.	8.8	8.6	9.0	8.6	7.5	7.5	6.3	7.3	8.6	7.6	7.7	8.0	8.0

[1] Station closed December 31, 1885.

[2] Station closed November 30, 1885.

APPENDIX 53.

Average number of clear, fair, and cloudy days at stations of the Signal Service, United
at each to December, 1885, *inclusive,*

[Cloudiness is recorded on a scale of 0 to 10, each observation   Clear days

[1] Station closed October 31, 1885.

APPENDIX 53.

States Army, for each month of the year. Computed from the commencement of observations from the tri-daily observations.

comprise from 0 to 8 tenths; fair, 9 to 22; and cloudy, 23 to 30, inclusive.]

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1

1
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1

Average number of clear, fair, and cloudy days at stations of the Signal

[1] Station closed November 30, 1885. [2] Record incomplete. [3] Station closed September 15, 1885.

Service, United States Army, for each month of the year, &c.—Continued.

Average number of clear, fair, and cloudy days at stations of the Signal

Districts and stations.	January.			February.			March.			April.			May.		
	Clear.	Fair.	Cloudy.	Clear.	Fair.	Cloudy.	Clear.	Fair.	Cloudy.	Clear.	Fair.	Cloudy.	Clear.	Fair.	Cloudy.
Southern Plateau—Continued:															
Prescott, Ariz	18.1	10.5	2.4	17.5	7.4	3.4	17.3	9.4	4.3	19.0	8.9	2.1	23.7	6.4	0.9
Thomas, Fort, Ariz	15.8	12.5	2.7	14.0	10.4	3.8	14.6	11.8	4.6	19.5	8.3	2.2	23.5	6.7	0.8
Yuma, Ariz	20.2	8.4	2.4	18.6	7.3	2.4	20.6	8.2	2.2	22.8	6.4	0.8	26.7	3.7	0.6
Middle Plateau:															
Winnemucca, Nev	11.6	12.1	7.3	9.7	10.6	7.6	14.7	10.1	6.2	11.4	12.0	6.6	13.3	12.6	5.1
Salt Lake City, Utah	8.2	11.7	11.1	7.2	10.7	10.4	10.6	10.7	9.7	7.5	12.8	9.7	10.7	13.2	7.1
Northern Plateau:															
Boisé City, Idaho	7.5	9.5	14.0	5.5	8.8	11.0	10.7	11.9	8.4	9.4	12.9	7.7	9.8	14.8	6.4
Lewiston, Idaho[1]	4.5	9.8	16.7	6.0	10.7	11.6	12.0	11.3	7.7	11.8	11.2	7.0	11.3	13.0	6.7
Dayton, Wash.[2]	3.3	11.2	16.5	6.5	10.0	11.8	11.3	12.7	7.0	10.2	11.5	8.3	10.5	13.5	7.0
Spokane Falls, Wash	5.5	12.5	13.0	6.8	8.8	12.6	12.2	11.8	7.0	11.2	11.6	7.2	9.2	14.6	7.2
North Pacific Coast:															
Canby, Fort, Wash	9.5	11.0	10.5	9.0	10.5	9.0	8.5	14.5	8.0	8.5	14.5	7.0	4.0	14.0	13.0
Olympia, Wash	2.1	9.1	19.8	3.5	7.2	17.5	5.2	10.9	14.9	5.6	11.9	12.5	6.6	11.0	13.4
Tatoosh Island, Wash	6.0	7.4	18.0	6.0	7.0	15.5	6.0	11.5	13.5	9.0	10.0	11.0	6.5	13.5	11.0
Portland, Oreg	3.9	7.4	19.7	2.7	6.8	19.3	5.3	7.6	18.1	6.3	9.0	14.7	5.7	10.0	15.3
Roseburg, Oreg	3.1	10.3	17.6	3.9	8.1	16.2	7.4	11.1	12.5	5.4	11.0	13.6	9.0	10.9	11.1
Middle Pacific Coast:															
Cape Mendocino, Cal	7.0	11.5	12.5	10.5	10.5	7.5	11.8	11.1	8.1	7.0	14.7	8.3	8.7	18.3	4.0
Red Bluff, Cal	13.6	8.9	8.5	11.8	9.0	7.5	14.8	10.0	6.2	12.4	10.9	6.7	16.6	9.8	4.6
Sacramento, Cal	12.1	10.3	8.6	13.0	8.2	7.0	15.8	8.0	7.2	14.5	10.1	5.4	20.7	7.4	2.9
San Francisco, Cal	11.4	10.3	9.3	9.6	10.4	8.2	11.3	11.4	8.3	11.7	11.8	6.5	14.3	10.9	5.8
South Pacific Coast:															
Los Angeles, Cal	17.5	8.6	4.9	13.1	9.5	5.6	12.2	11.0	7.8	10.4	12.5	7.1	11.5	13.5	6.0
San Diego, Cal	12.2	11.2	7.6	9.6	11.1	7.5	8.5	13.2	9.3	9.9	12.6	7.5	7.2	13.0	10.8
Alaska Stations:															
Alexander, Fort	2.5	10.5	18.0	14.5	9.0	4.5	6.5	9.0	15.5	4.0	8.0	18.0	5.0	12.0	14.0
Saint Michael's, Fort	6.8	9.7	14.5	12.7	7.1	8.5	8.7	10.2	12.1	5.3	8.8	15.9	4.0	9.8	17.2
Sitka	4.2	9.0	17.8	6.4	9.2	12.8	7.6	7.6	15.8	6.3	9.5	14.2	5.5	9.7	15.8
Unalashka	1.3	6.0	23.7	0.8	4.7	22.8	2.3	6.7	22.0	1.0	5.5	23.5	1.0	9.2	20.8
Behring's Island, Behring Sea	0.0	4.7	26.3	1.7	5.0	21.7	0.0	6.0	25.0	0.0	7.0	23.0	0.0	8.0	23.0

[1] Station closed December 31, 1885.

[2] Station closed November 30, 1885.

Service, United States Army, for each month of the year, &c.—Continued.

June.			July.			August.			September.			October.			November.			December.		
Clear.	Fair.	Cloudy.	Clear.	Fair.	Cloudy.	Clear.	Fair.	Cloudy.	Clear.	Fair.	Cloudy.	Clear.	Fair.	Cloudy.	Clear.	Fair.	Cloudy.	Clear.	Fair.	Cloudy.
23.8	5.2	1.0	16.5	11.8	2.7	14.6	14.0	2.4	24.1	4.7	1.2	23.7	6.1	1.2	22.1	6.5	1.4	19.5	8.6	2.9
20.2	8.2	1.6	12.5	14.7	3.8	10.7	16.7	3.6	20.5	7.5	2.0	22.4	6.6	2.0	20.2	7.8	2.0	17.2	9.3	4.5
26.5	3.0	0.5	22.8	7.4	0.8	21.0	8.2	1.8	26.2	3.5	0.3	24.4	6.1	0.5	22.5	6.3	1.2	21.2	7.6	2.2
15.5	12.0	2.5	24.4	6.0	0.6	25.7	4.6	0.7	22.6	5.3	2.1	19.3	9.1	2.6	14.0	11.0	5.0	13.0	10.9	7.1
14.7	12.2	8.1	16.2	12.8	2.5	15.9	12.0	8.1	17.5	9.7	2.8	13.0	11.8	6.2	10.5	11.0	8.5	8.3	10.0	12.7
11.5	13.9	4.6	18.4	11.2	1.4	21.8	8.0	1.2	17.0	8.9	4.1	13.0	10.8	7.2	10.1	10.9	9.0	7.3	9.7	14.0
10.5	13.0	6.5	17.5	10.8	2.7	22.7	7.0	1.8	16.5	9.7	3.8	10.9	10.8	9.8	7.8	10.8	11.4	6.2	9.6	15.2
9.5	14.0	6.5	17.8	10.4	2.8	22.5	7.7	0.8	14.4	11.8	3.8	10.7	11.8	8.5	9.4	10.8	9.8	5.8	9.8	16.4
8.2	14.2	7.6	14.0	12.0	5.0	21.4	8.2	1.4	13.8	10.6	5.6	8.6	11.2	11.2	4.4	13.4	12.2	5.4	11.4	14.2
1.0	14.5	14.5	4.5	13.0	13.5	11.5	15.0	4.5	9.8	11.4	9.8	10.7	11.7	8.0	6.8	6.0	17.7	5.0	11.7	14.3
5.8	11.6	12.6	10.8	18.3	6.9	12.2	12.8	6.0	6.4	12.5	11.1	4.9	11.7	14.4	2.1	9.7	18.2	2.2	8.0	20.8
1.5	13.0	15.5	7.0	14.5	9.5	13.0	13.0	5.0	4.0	11.5	14.5	8.0	11.8	11.7	2.0	7.7	20.3	4.0	8.7	18.3
6.8	9.7	13.5	14.5	8.1	8.4	15.4	8.9	6.7	11.9	10.1	8.0	7.8	9.8	13.4	5.1	9.0	15.9	4.3	7.8	18.9
10.0	10.2	9.8	17.4	10.0	3.6	20.6	8.4	2.0	15.6	9.1	5.3	7.9	13.5	9.6	3.7	13.4	12.9	2.2	10.9	17.9
10.3	15.7	4.0	12.7	10.3	2.0	23.0	7.0	1.0	19.2	8.5	2.3	14.2	12.8	4.0	8.5	13.3	8.1	8.0	12.7	10.3
23.0	5.0	2.0	27.8	3.1	0.1	28.7	2.2	0.1	25.4	3.8	0.8	21.4	7.1	2.5	18.2	6.0	5.8	12.8	9.4	8.8
24.8	4.1	1.1	29.3	1.6	0.1	29.6	1.4	0.0	26.0	3.6	0.4	23.0	5.9	2.1	18.0	6.9	5.1	13.0	7.9	10.1
12.0	11.3	6.7	8.3	15.3	7.4	9.0	15.1	6.9	13.0	12.5	4.5	14.9	11.9	4.2	14.1	10.0	5.9	13.2	9.1	8.7
9.2	15.8	5.0	12.3	17.9	0.8	16.5	13.4	1.1	17.6	11.2	1.2	17.9	10.6	2.5	18.4	8.9	2.7	17.5	8.4	5.1
6.6	15.3	8.1	8.3	16.6	6.1	9.9	16.9	4.2	12.1	13.9	4.0	13.6	12.3	5.1	13.6	10.5	5.9	13.1	11.4	6.5
4.5	7.5	18.0	2.0	8.0	21.0	5.0	10.0	16.0	5.0	8.5	16.5	5.0	10.5	15.5	8.0	7.0	15.0	7.0	9.5	14.5
3.8	10.3	16.4	3.1	7.2	20.7	2.0	6.5	22.5	2.0	7.9	20.1	2.6	9.2	19.2	6.8	9.1	14.2	9.7	9.6	11.6
8.0	6.0	16.0	3.2	8.8	19.0	7.3	9.5	14.2	7.3	7.5	15.2	6.0	8.3	16.7	3.3	7.3	19.4	6.7	9.1	15.2
0.6	6.0	23.4	0.8	7.4	22.8	2.4	8.6	20.0	0.7	5.0	24.3	1.3	6.7	23.0	1.0	6.7	22.3	1.0	8.0	22.0
1.3	5.7	23.0	1.0	10.0	20.0	1.0	7.3	22.7	2.0	11.3	16.7	0.0	12.7	18.3	0.3	8.3	21.4	0.0	11.0	20.0

[3] Station closed September 15, 1885. [4] Station closed December 31, 1885. [5] Record incomplete.

APPENDIX 54.

Dates of closing of navigation on the lakes and rivers at selected stations of the Sig-

Stations.	Lakes or rivers.	Navigation closed. 1871.	1872.	1873.	1874.	1875.
Albany, N. Y	Hudson River	Nov. 29	Dec. 10	Nov. 26	Dec. 15	Dec. 1
Alpena, Mich	Lake Huron	Dec. 10	Dec. 11	Dec. 5	Dec. 8	Dec. 14
Baltimore, Md	Patapsco River	([2])	([2])	([2])	([2])	([2])
Benton, Fort, Mont	Missouri River	....	....	....	....	....
Bismarck, Dak	......do	([3])	Dec. 11	Dec. 5	Nov. 17	Nov. 19
Buffalo, N. Y	Lake Erie	Dec. 27	Dec. 18	Nov. 28	Dec. 5	Dec. 11
Buford, Fort, Dak	Missouri River	....	....	....	....	....
Cairo, Ill	Mississippi River	([3])	([3])	([3])	Dec. 1	Jan. 8
Cairo, Ill	Ohio River	([3])	([3])	([3])	([2])	Feb. 15
Chattanooga, Tenn	Tennessee River	([2])	([2])	([2])	([2])	([2])
Chicago, Ill	Lake Michigan	([3])	([3])	Dec. 13	Dec. 1	([3])
Cincinnati, Ohio	Ohio River	Dec. 21	Dec. 22	([2])	Jan. 11, '75	([2])
Cleveland, Ohio	Lake Erie	Dec. 11	Dec. 14	Dec. 12	Dec. 15	Dec. 16
Custer, Fort, Mont	Big Horn River	....	....	....	....	....
Davenport, Iowa	Mississippi River	Dec. 5	Nov. 29	Dec. 28	Nov. 30	Nov. 23
Detroit, Mich	Detroit River	([3])	([3])	([3])	Dec. 17	([2])
Dubuque, Iowa	Mississippi River	Nov. 11	Nov. 18	Nov. 19	Nov. 21	Nov. 19
Duluth, Minn	Lake Superior	Dec. 6	Nov. 24	Nov. 25	Dec. 9	Dec. 2
Erie, Pa	Lake Erie	......	......	Dec. 15	Dec. 15	Dec. 15
Escanaba, Mich	Little Bay de Noquette.	Dec. 6	Nov. 30	Nov. 24	Nov. 28	Dec. 11
Keokuk, Iowa	Mississippi River	Dec. 4	Dec. 4	([2])	Jan. 5	Nov. 27
La Crosse, Wis	......do	Nov. 22	Nov. 22	Nov. 27	Nov. 20	Nov. 22
Leavenworth, Kans	Missouri River	([3])	([3])	([3])	Jan 5, '75	Feb. 4, '76
Louisville, Ky	Ohio River	([3])	([3])	([3])	([3])	Jan. 12
Mackinaw City, Mich	Mackinaw Straits	....	....	....	....	....
Marquette, Mich	Lake Superior	Nov. 22	Nov. 25	Nov. 22	Nov. 21	Nov. 24
Milwaukee, Wis	Lake Michigan	([2])	([2])	([2])	([3])	([2])
Moorhead, Minn	Red River	....	....	....	....	....
Nashville, Tenn	Cumberland River	([2])	([2])	([2])	([2])	([2])
Omaha, Nebr	Missouri River	....	....	....	Nov. 22	Nov. 23
Oswego, N. Y	Lake Ontario	Dec. 2	Dec. 6	Dec. 1	Dec. 4	Dec. 3
Pittsburg, Pa	Monongahela River	([2])	([2])	([2])	([2])	([2])
Poplar River, Mont	Missouri River	....	....	....	....	....
Port Huron, Mich	Lake Huron	Nov. 30	Nov. 23	Nov. 19	Dec. 20	Dec. 11
Rochester (Charlotte), N. Y.	Lake Ontario	([3])	([3])	([3])	Dec. 17	Dec. 3
Saint Louis, Mo	Mississippi River	Nov. 29	Nov. 29	Jan. 14, '74	Dec. 30	([2])
Saint Paul, Minn	...do	Nov. 20	Nov. 12	Nov. 15	Nov. 16	Nov. 17
Saint Vincent, Minn.[1]	Red River	Nov. 13	Oct. 28	Nov. 7	Oct. 17	Nov. 4
Sandusky, Ohio	Lake Erie	Dec. 7	Nov. 30	Nov. 29	Dec. 12	Jan. 18, '76
Sully, Fort, Dak	Missouri River	....	....	....	....	....
Toledo, Ohio	Lake Erie	Dec. 4	Nov. 29	Dec. 5	Dec. 9	Dec. 10
Yankton, Dak	Missouri River	....	....	....	Nov. 26	Nov. 21

[1] Data for Pembina, Dak., prior to September, 1880.

APPENDIX 54.

nal Service, United States Army, for the years specified (1871 *to* 1885, ***both inclusive***).

NAVIGATION CLOSED.

1876.	1877.	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.
Dec. 10	Dec. 29	Dec. 21	Dec. 21	Nov. 25	Jan. 5,'82	Dec. 4	Dec. 16	Dec. 19	Dec. 8
Dec. 9	Jan. 5,'78	Dec. 7	Dec. 12	Dec. 12	Jan. 1,'83	Dec. 10	Dec. 19	Dec. 17	Jan. 8,'86
(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
....	....	....	....	....	....	Jan. 25	Dec. 22	(3)	(3)
Nov. 15	Nov. 29	Dec. 16	Nov. 27	Nov. 18	Nov. 17	Nov. 11	Nov. 15	Dec. 14	Dec. 6
Dec. 17	Dec. 13	Dec. 7	Dec. 14	Dec. 8	Dec. 30	Dec. 1	Dec. 7	Dec. 6	Dec. 25
....	....	....	Nov. 8	Nov. 12	Nov. 9	Nov. 6	Nov. 8	Nov. 8	Nov. 9
Dec. 31	(3)	Dec. 23	Dec. 18	Dec. 27	(3)	Dec. 9	Dec. 20	Dec. 18	Dec. 7
Dec. 31	(3)	Dec. 25	(3)	Dec. 29	(2)	(2)	(2)	(2)	Dec. 9
(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Dec. 1	Dec. 5	(3)	Dec. 16	Nov. 30	Nov. 17	Dec. 7	Dec. 15	(3)	Dec. 26
Dec. 18	(2)	Dec. 25	(2)	Dec. 29	(2)	(2)	(2)	Dec. 25	Jan 14,'86
Dec. 11	Dec. 12	Dec. 15	Dec. 24	Dec. 13	Dec. 13	Dec. 11	Dec. 20	Dec. 15	Dec. 28
....	....	....	....	Nov. 17	(3)	Nov. 12	Dec. 8	Dec. 17	Dec. 10
Dec. 1	Nov. 30	Dec. 18	Dec. 14	Nov. 22	Dec. 29	Nov. 22	Dec. 2	Nov. 22	Dec. 5
(3)	(3)	(3)	(3)	(3)	Dec. 7	(3)	Dec. 9	Dec. 10	Dec. 12
Nov. 26	Dec. 23	Nov. 12	Nov. 23	Nov. 16	Nov. 24	Nov. 21	Nov. 23	Nov. 21	Nov. 18
Dec. 4	Dec. 7	Nov. 14	Nov. 29	Nov. 30	Dec. 27	Dec. 4	Dec. 4	Dec. 1	Nov. 29
Dec. 10	Dec. 15	Dec. 15	Dec. 15	Dec. 15	Dec. 15	Dec. 8	Dec. 15	Dec. 13	Dec. 10
Dec. 8	Jan. 5,'78	Dec. 15	Jan. 5,'80	Dec. 19	Jan. 1,'82	Dec. 10	Dec. 15	Dec. 18	Dec. 8
Nov. 23	Dec. 10	Dec. 20	Dec. 10	Nov. 18	Dec. 26	Dec. 4	Dec. 11	Dec. 12	Dec. 6
Nov. 30	Dec. 2	Dec. 11	Dec. 12	Nov. 19	Dec. 31	Dec. 8	Dec. 18	Nov. 24	Dec. 7
Dec. 31	Jan. 4,'78	Dec. 18	Dec. 14	Dec. 6	Dec. 30	Jan. 9,'83	Dec. 31	Dec. 18	Jan. 7,'86
Dec. 9	(3)	Dec. 26	(3)	Dec. 28	(2)	(2)	(2)	(2)	Feb. 18
....	....	....	....	....	....	Jan. 14,'83	Dec. 22	Jan. 3,'85	Jan. 6,'86
Nov. 26	Nov. 28	Nov. 26	Nov. 23	Nov. 29	Nov. 23	Nov. 27	Nov. 28	Dec. 5	Dec. 2
(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
....	....	....	....	....	Nov. 15	Nov. 11	Nov. 17	Nov. 19	Nov. 25
(2)	Jan. 1	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Nov. 24	Jan. 4,'78	Dec. 18	Dec. 10	Dec. 28	Jan. 2,'82	Dec. 1	Dec. 29	Dec. 17	Dec. 9
Dec. 2	Dec. 6	Dec. 8	Dec. 1	Dec. 6	Dec. 11	Dec. 5	Dec. 11	Dec. 12	Dec. 16
(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
....	....	....	....	....	....	(3)	(3)	(3)	(3)
Dec. 16	Dec. 9	Dec. 15	Dec. 14	Dec. 10	Nov. 21	Dec. 10	Jan. 5, '84	Nov. 13	Dec. 16
Dec. 1	Dec. 21	Dec. 1	Dec. 3	Dec. 19	Dec. 5	Dec. 8	Dec. 12	Dec. 21	Dec. 15
Dec. 2	(2)	Dec. 17	Dec. 18	Nov. 18	(2)	Dec. 7	Dec. 19	Dec. 19	Dec. 10 Jan 9,'86
Nov. 19	Nov. 27	Dec. 1	Oct. 25	Nov. 16	Nov. 18	Oct. 19	Nov. 6	Nov. 12	Nov. 16
Oct. 10	Dec. 1	Oct. 30	Nov. 2	Nov. 12	Nov. 13	Nov. 11	Nov. 11	Nov. 22	Nov. 13
Dec. 9	Dec. 27	Dec. 24	Dec. 13	Nov. 19	Jan. 1,'82	Dec. 8	Dec. 15	Dec. 15	Dec. 7
....	....	....	....	....	....	....	....	Dec. 16	Dec. 8
Dec. 5	Dec. 10	Dec. 18	Dec. 15	Dec. 1	Dec. 27	Dec. 16	Dec. 18	Dec. 15	Dec. 7
Nov. 15	Dec. 24	Dec. 14	Dec. 3	Nov. 17	Nov. 18	Dec. 2	Dec. 16	Dec. 14	Dec. 8

(2) Navigation uninterrupted. (3) No reliable record.

APPENDIX 55.

Dates of opening of navigation on the lakes and rivers, at selected stations of the

Stations.	Lakes or rivers.	NAVIGATION OPENED.					
		1871.	1872.	1873.	1874.	1875.	1876.
Albany, N. Y	Hudson River	Mar. 13	Apr. 8	Apr. 14	Mar. 21	Apr. 8	Apr. 1
Alpena, Mich	Lake Huron	Mar. 17	Apr. 17	Apr. 30	Mar. 20	Apr. 19	Apr. 19
Baltimore, Md	Patapsco River	(2)	(2)	(2)	(2)	(2)	(2)
Benton, Fort, Mont	Missouri River	....	....	....	....	....	....
Bismarck, Dak	do	Apr. 3	Apr. 15	Mar. 17	Apr. 13	Apr. 17	Mar. 25
Buffalo, N. Y	Lake Erie	Apr. 1	May 5	Apr. 29	Apr. 18	May 12	May 10
Buford, Fort, Dak	Missouri River	....	....	....	....	....	....
Cairo, Ill	Mississippi River.	(3)	(3)	(3)	Dec. 31	Feb. 24	(2)
Cairo, Ill	Ohio River	(3)	(3)	(3)	(2)	Feb. 22	(2)
Chattanooga, Tenn	Tennessee River	(2)	(2)	(2)	(2)	(2)	(2)
Chicago, Ill	Lake Michigan	Apr. 3	Apr. 28	May 1	Apr. 29	Apr. 28	Apr. 28
Cincinnati, Ohio	Ohio River	(3)	Feb. 20	Feb. 4	(2)	Feb. 24	(2)
Cleveland, Ohio	Lake Erie	Mar. 19	Mar. 10	Mar. 11	Mar. 18	Apr. 1	Apr. 4
Custer, Fort, Mont	Big Horn River	....	....	....	....	....	....
Davenport, Iowa	Mississippi River.	Feb. 25	Mar. 23	Mar. 15	Mar. 10	Apr. 2	Mar. 7
Detroit, Mich	Detroit River	Mar. 8	Apr. 4	Apr. 7	Mar. 24	Mar. 29	Apr. 5
Dubuque, Iowa	Mississippi River.	Mar. 13	Apr. 3	Apr. 1	Mar. 25	Apr. 5	Mar. 14
Duluth, Minn	Lake Superior	May 4	May 14	May 24	May 4	May 15	May 9
Erie, Pa	Lake Erie	....	....	Apr. 17	Apr. 4	Apr. 15	Apr. 12
Escanaba, Mich	Little Bay de Noquette.	Apr. 11	Apr. 28	May 1	Apr. 30	May 4	May 6
Keokuk, Iowa	Mississippi River.	(3)	Mar. 14	Mar. 10	Mar. 28	Dec. 22	(2)
La Crosse, Wis	do	Mar. 13	Apr. 8	Mar. 19	Mar. 28	Apr. 7	Apr. 7
Leavenworth, Kans	Missouri River	(3)	Feb. 20	(3)	Feb. 1	Mar. 14	Feb. 8
Louisville, Ky	Ohio River	(3)	(3)	(3)	(3)	Jan. 30	(3)
Mackinaw City, Mich	Mackinaw Straits.	Apr. 2	Apr. 28	May 1	Apr. 29	Apr. 28	Apr. 28
Marquette, Mich	Lake Superior	May 9	May 13	May 21	May 13	May 20	May 12
Milwaukee, Mich	Lake Michigan	(2)	(2)	(2)	(2)	(2)	(2)
Moorhead, Minn	Red River	....	....	....	....	....	....
Nashville, Tenn	Cumberland River.	(2)	( )	(2)	(2)	(2)	(2)
Omaha, Nebr	Missouri River	....	....	....	....	Mar. 30	Apr. 3
Oswego, N. Y	Lake Ontario	Apr. 4	Apr. 13	Apr. 7	Apr. 2	Apr. 29	Apr. 6
Pittsburg, Pa	Monongahela River.	(2)	(2)	(2)	(2)	(2)	(2)
Poplar River, Mont	Missouri River	....	....	....	....	....	....
Port Huron, Mich	Lake Huron	Mar. 16	Apr. 12	Apr. 14	Mar. 23	Apr. 10	Apr. 6
Rochester (Charlotte), N. Y.	Lake Ontario	(3)	(3)	(3)	Mar. 23	Apr. 19	Apr. 8
Saint Louis, Mo	Mississippi River.	Jan. 13	Feb. 24	Feb. 10	Jan. 21	Mar. 1	(2)
Saint Paul, Minn	do	Apr. 10	Apr. 23	Apr. 17	Apr. 23	Apr. 25	Apr. 22
Saint Vincent, Minn.[1]	Red River	Apr. 16	Apr. 20	Apr. 25	Apr. 19	Apr. 21	Apr. 22
Sandusky, Ohio	Lake Erie	Apr. 1	Apr. 1	Mar. 18	Mar. 7	Apr. 1	Mar. 10
Sully, Fort, Dak	Missouri River	....	....	....	....	....	....
Toledo, Ohio	Lake Erie	Mar. 16	Apr. 9	Mar. 28	Mar. 19	Apr. 13	Apr. 3
Yankton, Dak	Missouri River	....	....	....	....	Apr. 3	Apr. 6

[1] Data for Pembina, Dak., prior to September, 1880.
[2] Navigation uninterrupted.
[3] No reliable record.

APPENDIX 55.

Signal Service, United States Army, for the years specified (1871 *to* 1886, *both inclusive*)·

NAVIGATION OPENED.

1877.	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.	1886.
Mar. 26	Mar. 7	Mar. 29	Mar. 1	Mar. 16	Mar. 5	Mar. 31	Mar. 26	Apr. 8	Mar. 27
Apr. 21	Mar. 10	Apr. 5	Mar. 6	Apr. 29	Mar. 6	Apr. 19	Apr. 11	Apr. 26	Apr. 15
([2])	([2])	([2])	([2])	([2])	([2])	([2])	([2])	([2])	([2])
......	......	......	......	......	Mar. 15	Mar. 15	Feb. 24	Feb. 28	Feb. 11
Mar. 30	Mar. 16	Mar. 29	Mar. 30	Mar. 29	Apr. 5	Apr. 10	Mar. 29	Apr. 4	Apr. 8
Apr. 26	Mar. 16	Apr. 24	Mar. 19	May 1	Mar. 26	Apr. 25	Apr. 22	May 2	Apr. 15
......	......	Apr. 19	Apr. 25	Apr. 16	Apr. 17	Apr. 13	Apr. 20	Apr. 28	May 5
Feb. 4	([3])	Jan. 30	Jan. 3	Feb. 25	([3])	Feb. 13	Feb. 4	Feb. 4	Feb. 17
Jan. 20	([3])	Jan. 26	([3])	Jan. 19	([2])	([2])	([2])	([2])	Jan. 19
([2])	([2])	([2])	([2])	([2])	([2])	([2])	([2])	([2])	([2])
Apr. 20	Mar. 14	Apr. 23	Apr. 5	May 4	Apr. 5	Apr. 28	Apr. 28	May 6	Mar. 20
Jan. 12	([2])	Jan. 16	([2])	Jan. 13	([2])	([2])	([2])	Mar. 6	Feb. 11
Apr. 10	Mar. 20	Apr. 2	Mar. 9	Mar. 24	Mar. 14	Apr. 7	Mar. 27	Apr. 17	Mar. 25
......	......	......	([3])	([3])	Mar. 29	Mar. 15	Mar. 19	Mar. 12	Feb. 28
Mar. 30	Mar. 9	Mar. 16	Mar. 6	Apr. 16	Mar. 10	Mar. 27	Mar. 24	Mar. 31	Mar. 22
Apr. 10	([3])	([3])	Mar. 9	([3])	Mar. 13	Apr. 7	Mar. 27	Apr. 5	Mar. 15
Feb. 25	Mar. 10	Mar. 22	Mar. 5	Apr. 12	Mar. 2	Mar. 29	Apr. 1	Apr. 5	Mar. 27
Apr. 29	Apr. 12	Apr. 28	May 1	May 9	Apr. 23	May 2	May 1	Apr. 27	May 4
Apr. 22	Apr. 1	Apr. 1	Mar. 20	Apr. 27	Apr. 4	Apr. 25	Apr. 10	Apr. 30	Apr. 13
Apr. 21	Mar. 16	Apr. 25	Apr. 12	May 3	Apr. 7	Apr. 24	Apr. 15	May 5	Apr. 24
Mar. 26	Mar. 8	Mar. 15	Jan. 8	Mar. 30	Jan. 12	Mar. 5	Mar. 24	Mar. 20	Mar. 16
Mar. 27	Feb. 22	Mar. 26	Mar. 7	Apr. 9	Mar. 4	Apr. 6	Mar. 29	Apr. 1	Mar. 28
Feb. 9	Jan. 2	Feb. 10	Jan. 6	Mar. 14	Jan. 21	Feb. 25	Feb. 25	Mar. 10	Feb. 20
Jan. 17	([3])	Jan. 22	([3])	Jan. 23	([2])	([2])	([2])	Mar. 1	([2])
Apr. 20	Mar. 14	Apr. 23	Apr. 5	May 4	Apr. 5	Apr. 25	Apr. 24	May 1	Apr. 21
May 5	Apr. 18	May 8	May 4	May 11	Apr. 25	May 5	Apr. 30	May 11	Apr. 28
([2])	([2])	([2])	([2])	([2])	([2])	([2])	([2])	([2])	([2])
......	......	......	......	Apr. 23	Apr. 14	Apr. 16	Apr. 19	Apr. 24	Apr. 12
Jan. 7	([2])	([2])	([2])	([2])	([2])	([2])	([2])	([2])	([2])
Mar. 2	Feb. 19	Mar. 9	Apr. 5	Apr. 13	Mar. 10	Mar. 9	Apr. 5	Apr. 14	Mar. 17
Apr. 19	Mar. 9	Apr. 9	Mar. 21	Apr. 15	Mar. 21	Apr. 5	Apr. 5	May 6	Apr. 1
([2])	([2])	([2])	([2])	([2])	([2])	([2])	([2])	([2])	([2])
......	......	......	......	......	Apr. 27	May 3	Apr. 29	Apr. 31	May 7
Apr. 23	Mar. 24	Apr. 3	Mar. 22	Apr. 27	Mar. 7	Apr. 18	Apr. 8	Apr. 23	Mar. 28
Apr. 5	Apr. 4	Apr. 7	Mar. 24	Mar. 26	Mar. 30	Apr. 9	Apr. 4	Apr. 24	Apr. 4
Feb. 6	([3])	Jan. 31	Jan. 1	Feb. 15	([3])	Jan. 30	Feb. 5	Dec. 24	Feb. 17
							Dec. 29		
Apr. 17	Apr. 20	Apr. 21	Apr. 14	Apr. 15	Apr. 10	Apr. 20	Apr. 16	Apr. 21	Apr. 17
Apr. 23	Mar. 18	Apr. 12	Apr. 24	Apr. 25	Apr. 17	Apr. 21	Apr. 19	Apr. 21	Apr. 15
Apr. 2	Mar. 6	Mar. 24	Mar. 8	Mar. 19	Mar. 1	Mar. 15	Mar. 18	Apr. 1	Mar. 31
......	......	......	......	......	......	......	Mar. 26	Mar. 18	Mar. 23
Apr. 17	Mar. 18	Apr. 7	Mar. 3	Apr. 7	Feb. 25	Apr. 9	Mar. 20	Apr. 1	Mar. 23
Feb. 22	Feb. 19	Mar. 23	Feb. 24	Apr. 24	Mar. 17	Mar. 13	Mar. 22	Mar. 14	Mar. 18

[1] Data for Pembina, Dak., prior to September, 1880.
[2] Navigation uninterrupted.
[3] No reliable record.

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